

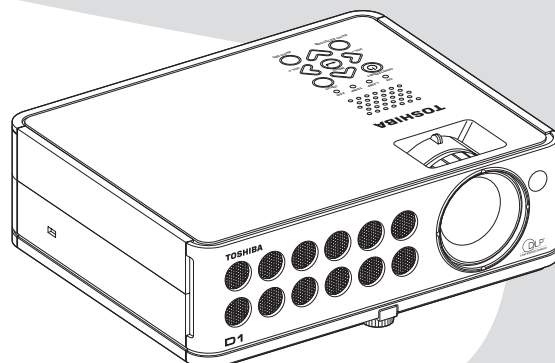
TOSHIBA

FILE NO. 330-200306

SERVICE MANUAL

DLP DATA PROJECTOR

TDP-D1
TDP-D2



TDP-D1. TDP-D2

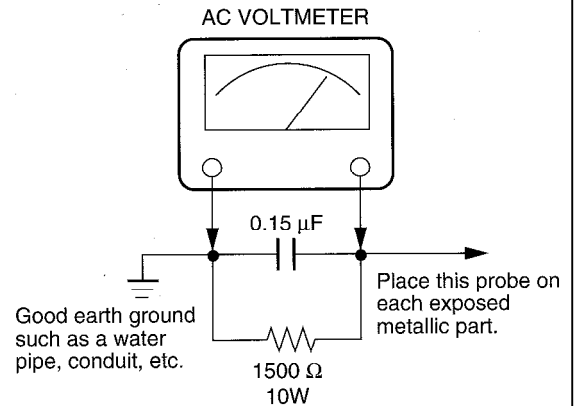
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SAFETY PRECAUTION

WARNING: Service should not be attempted by anyone unfamiliar with the necessary precautions on this projector. The following are the necessary precautions to be observed before servicing this chassis.

1. An isolation Transformer should be connected in the power line between the projector and the AC line before any service is performed on the projector.
2. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as; non-metallic control knobs, insulating covers, shields, isolation resistor-capacitor network etc.
3. Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as terminals, screwheads, metal overlays, control shafts etc. to be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly into a AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000ohm per volt or more sensitivity in the following manner: Connect a 1500ohm 10W resistor, paralleled by a 0.15 μ F, AC type capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500ohm resistor and 0.15 μ F capacitor. Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 5.25V(rms). This corresponds to 3.5 mA(AC). Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



PRODUCT SAFETY NOTICE

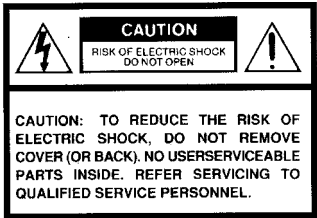
Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements; electrical components having such features are identified by the international hazard symbols on the schematic diagram and the parts list.

Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire or other hazards.

ULTRAVIOLET DANGER IN SERVICE MODE

Eye damage may result from directly viewing the light produced by the lamp used in this product. Always turn off lamp before opening this cover. Ultraviolet radiation eye protection required during servicing.

SAFETY PRECAUTIONS



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE. DANGEROUS HIGH VOLTAGES ARE PRESENT INSIDETHE ENCLOSURE. DO NOT OPEN THE CABINET. REFER SERVICING TO QUALIRED PERSONNEL ONLY.

CAUTION: Laser beam is emitted when the laser button of the remote control is pressed. Do not look from the front of the remote control. Do not face toward a person or to a mirror.

FCC Radio Frequency Interference Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiates radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING: Changes or modifications made to this equipment, not expressly approved by Toshiba, or parties authorized by Toshiba, could void the user's authority to operate the equipment.

Notice: This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

IMPORTANT PRECAUTIONS

Save Original Packing Materials

The original shipping carton and packing materials will come in handy if you ever have to ship your projector. For maximum protection, repack the set as it was originally packed at the factory.

Avoid Volatile Liquid

Do not use volatile liquids, such as an insect spray, near the unit. Do not leave rubber or plastic products touching the unit for a long time. They will mar the finish.

Moisture Condensation

Never operate this unit immediately after moving it from a cold location to a warm location. When the unit is exposed to such a change in temperature, moisture may condense on the crucial internal parts. To prevent the unit from possible damage, do not use the unit for at least 2 hours when there is an extreme or sudden change in temperature.

In the spaces provided below, record the Model and Serial No. located at the rear of your projector.

Mode No. _____ Serial No. _____

Retain this information for future reference.

IMPORTANT SAFETY INSTRUCTIONS

CAUTION: PLEASE READ AND OBSERVE ALL WARNINGS AND INSTRUCTIONS GIVEN IN THIS OWNER'S MANUAL AND THOSE MARKED ON THE UNIT. RETAIN THIS BOOKLET FOR FUTURE REFERENCE.

This set has been designed and manufactured to assure personal safety. Improper use can result in electric shock or fire hazard. The safeguards incorporated in this unit will protect you if you observe the following procedures for installation, use and servicing. This unit is fully transistorized and does not contain any parts that can be repaired by the user.

DO NOT REMOVE THE CABINET COVER, OR YOU MAY BE EXPOSED TO DANGEROUS VOLTAGE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

1. Read Owner's Manual

After unpacking this product, read the owner's manual carefully, and follow all the operating and other instructions.



2. Power Sources

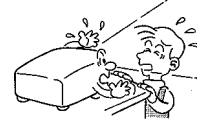
This product should be operated only from the type of power source indicated on the marking label. If you are not sure of the type of power supply to your home, consult your product dealer or local power company.

For products intended to operate from battery power, or other sources, refer to the operating instructions.



3. Source of Light

Do not look into the lens while the lamp is on. The strong light from the lamp may cause damage to your eyes or sight.



4. Ventilation

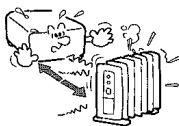
Openings in the cabinet are provided for ventilation and to ensure reliable operation of the product and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug or other similar surface. This product should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.



IMPORTANT SAFETY INSTRUCTIONS

5. Heat

The product should be situated away from heat sources such as radiators heat registers, stoves, or other products (including amplifiers) that produce heat.



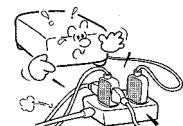
7. Cleaning

Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.



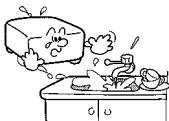
9. Overloading

Do not overload wall outlets; extension cords, or integral convenience receptacles as this can result in a risk of fire or electric shock.



6. Water and Moisture

Do not use this product near water - for example, near a bath tub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool and the like.



8. Power-Cord Protection

Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the product.



10. Lightning

For added protection for this product during storm, or when it is left unattended and unused for long periods of time, unplug it from the wall outlet.

This will prevent damage to the product due to lightning and power-line surges.



IMPORTANT SAFETY INSTRUCTIONS

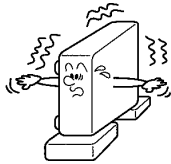
11. Object and Liquid Entry

Never push objects of any kind into this product through openings as they may touch dangerous voltage points or short-out parts that could result in a fire or electric shock. Never spill liquid of any kind on the product.



12. Do not place the product vertically

Do not use the product in the upright position to project the pictures at the ceiling, or any other vertical positions. It may fall down and dangerous.



13. Stack Inhibited

Do not stack other equipment on this product or do not place this product on the other equipment. Top and bottom plates of this product develops heat and may give some undesirable damage to other unit.



14. Attachments

Do not use attachments not recommended by the product manufacturer as they may cause hazards.

15. Accessories

Do not place this product on an unstable cart, stand, tripod, bracket, or table. The product may fall, causing serious injury to a child or adult, and serious damage to the product. Use only with a cart, stand, tripod, bracket, or table recommended by the manufacturer, or sold with the product. Any mounting of the product should follow the manufacturer's instructions and should use a mounting accessory recommended by the manufacturer.

A product and cart combination should be moved with care. Quick stops, excessive force, and uneven surfaces may cause the product and cart combination to overturn.



IMPORTANT SAFETY INSTRUCTIONS

16. Damage Requiring Service

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- When the power-supply cord or plug is damaged.
- If liquid has been spilled, or objects have fallen into the product.
- If the product has been exposed to rain or water.
- If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
- If the product has been dropped or damaged in any way.
- When the product exhibits a distinct change in performance - this indicates a need for service.

17. Servicing

Do not attempt to service this product yourself as opening or removing covers may expose you to dangerous voltage or other hazards. Refer all servicing to qualified service personnel.



18. Replacement Parts

When replacement parts are required, be sure the service technician has used replacement parts specified by the manufacturer or have the same characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards. (Replacement of the lamp only should be made by users.)

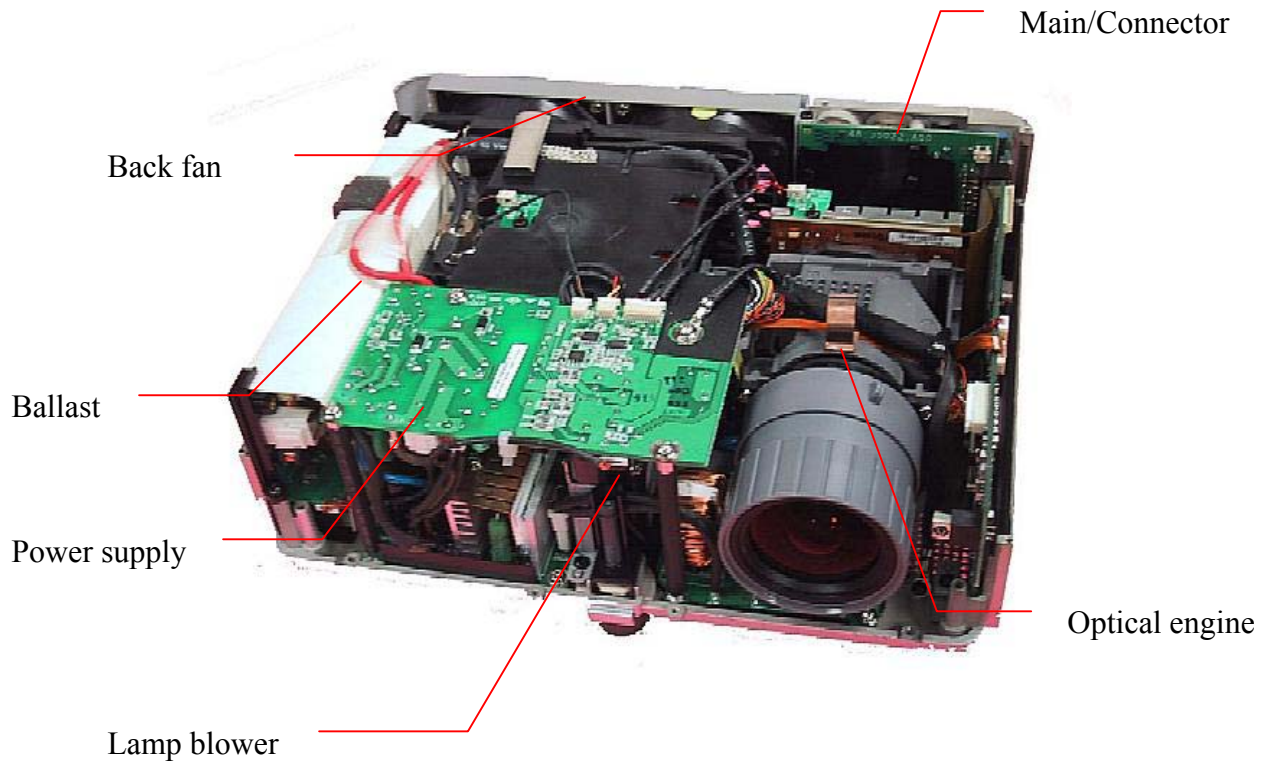
19. Safety Check

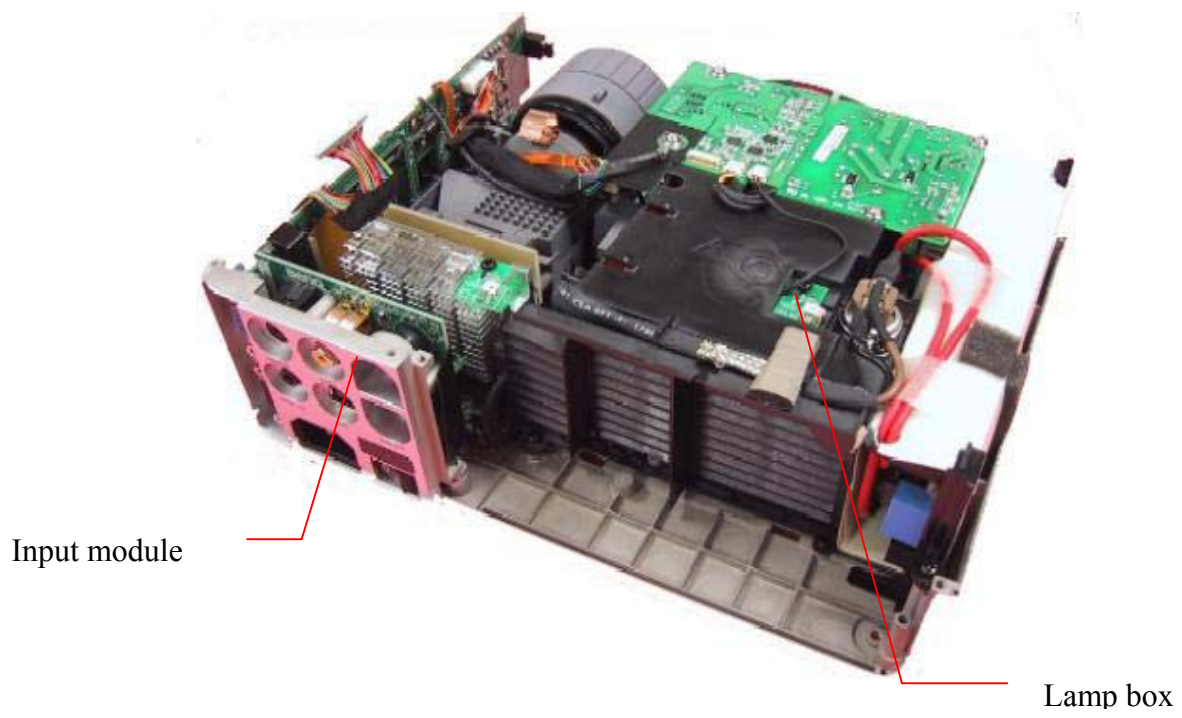
Upon completion of any service or repairs to this product, ask the service technician to perform safety checks to determine that the product is in proper operating condition.



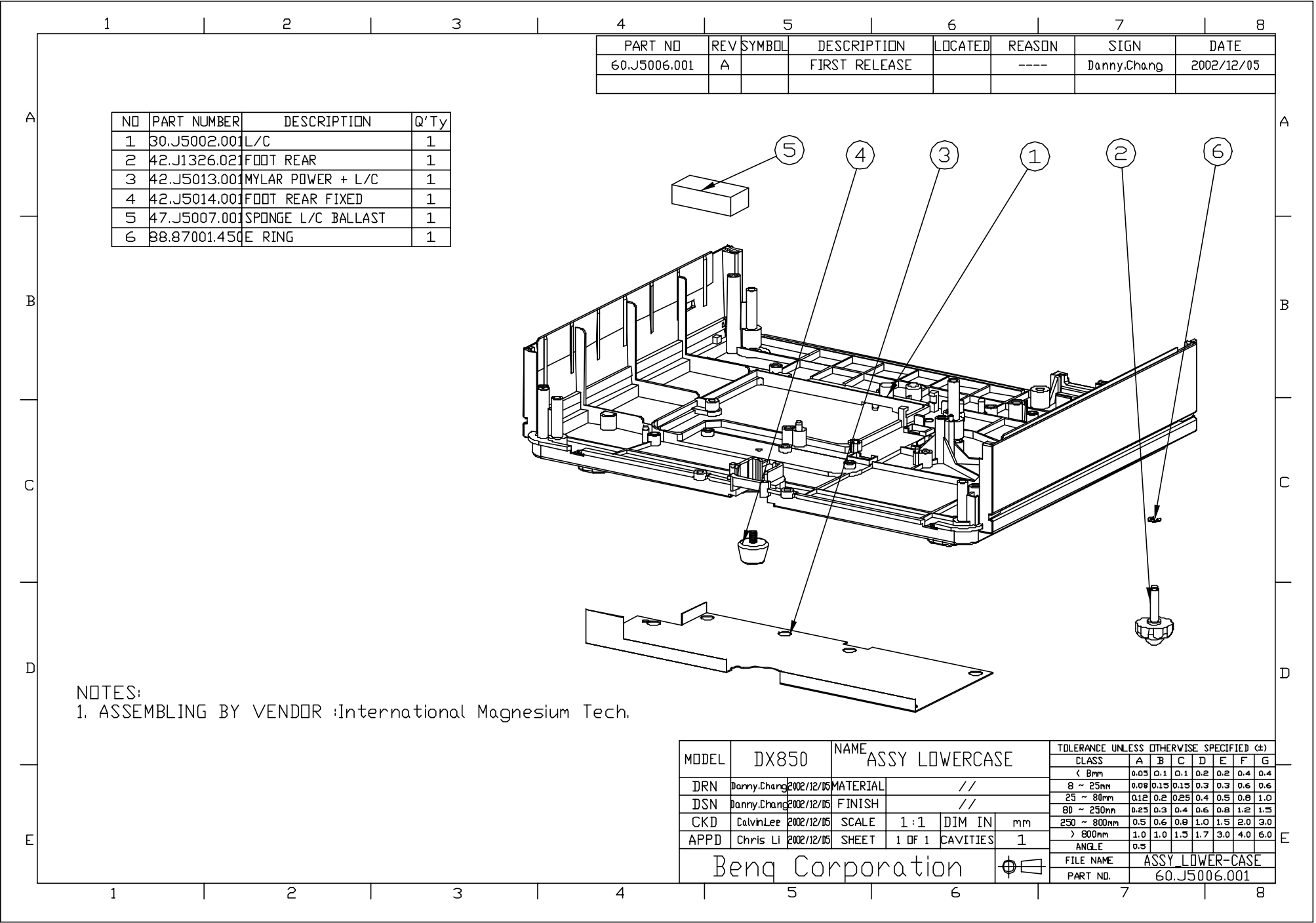
Chapter 1 Major Part Locations

The top illustration shows the parts from the front of the projector. The illustration on the next page shows the parts visible from the rear of the projector. To see exploded views of the case parts, major components and optical engine,



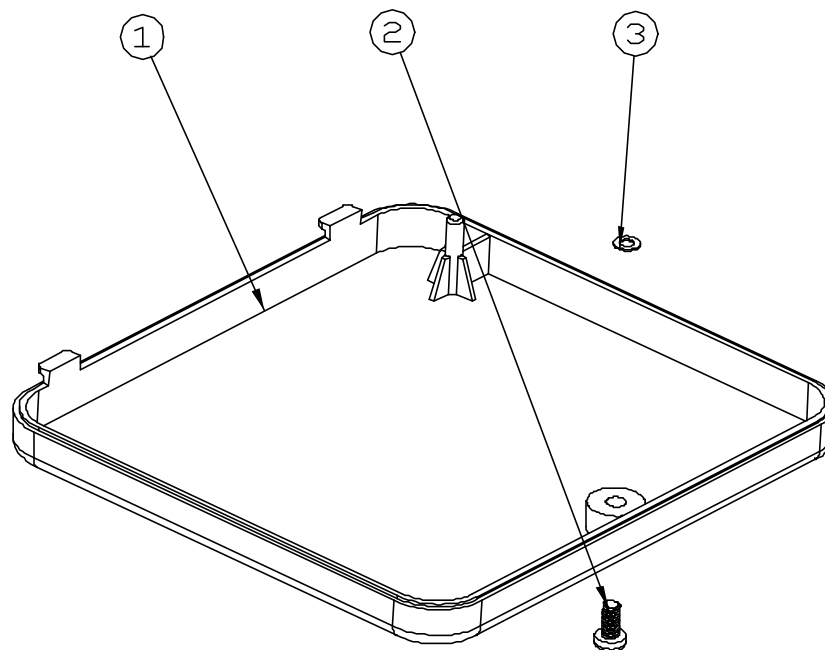


Chapter 2 Assy and Disassy drawing



1	2	3	4	5	6	7	8
PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5007.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	30.J5003.001	DOOR	1
2	86.4A524.6R0	SCREW BIND	1
3	88.00032.001	WASH NYLON	1



NOTES:
1. ASSEMBLING BY VENDOR :International Magnesium Tech.

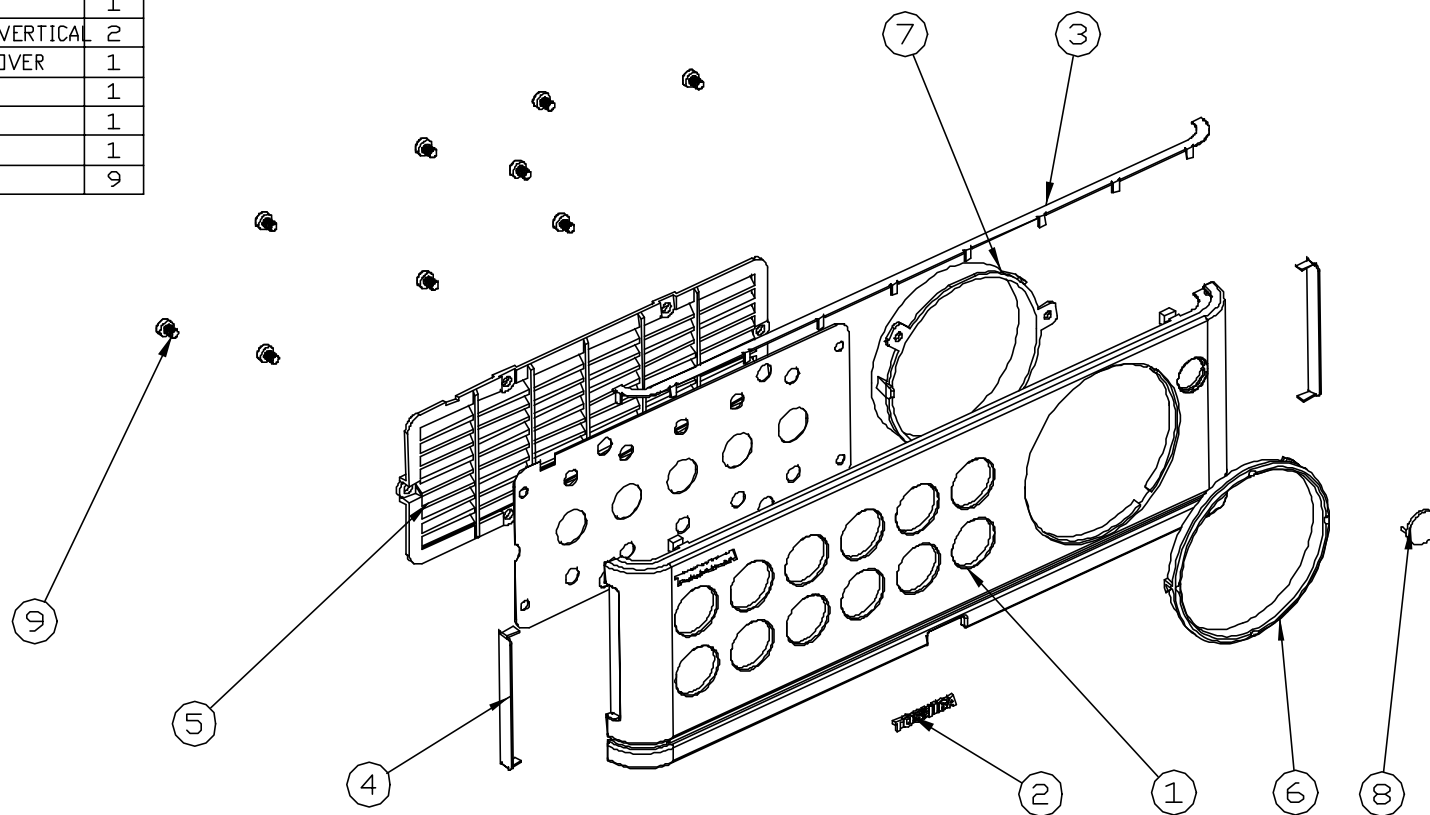
MODEL	DX850	NAME				TOLERANCE UNLESS OTHERWISE SPECIFIED (+)								
		ASSY DOOR				CLASS	A	B	C	D	E	F	G	
						< 8mm	0.03	0.1	0.1	0.2	0.2	0.4	0.4	
DRN	Danny.Chang	2002/12/05	MATERIAL			//	8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6
DSN	Danny.Chang	2002/12/05	FINISH			//	25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0
CKD	CalvinLee	2002/12/05	SCALE	1 : 1	DIM IN	mm	80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2	1.5
APPD	Chris LI	2002/12/05	SHEET	1 OF 1	CAVITIES	1	250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0
						> 800mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0	
						ANGLE	0.5							
Bena Corporation								FILE NAME						
								ASSY DOOR						
								PART NO.						
								60.J5007.001						

Beng Corporation



NO	PART NUMBER	DESCRIPTION	Q'Ty
1	30.J5004.001	F/C	1
2	31.J5008.001	NAME PLATE	1
3	34.J5006.001	MESH F/C + T/C	1
4	34.J5009.001	MESH F/C SIDE VERTICAL	2
5	42.J5004.001	LOUVER FRONT COVER	1
6	42.J5006.001	LENS IR FNT	1
7	42.J5008.001	RING FNT CHROM	1
8	42.J5009.001	CVR FNT	1
9	B6.1AK24.4R	SCREW	9

PART NO	REV	SYMBOL	DESCRIPTION	REASON	SIGN	DATE
60.J5008.001	A		FIRST RELEASE	----	Danny.Chang	2002/12/05



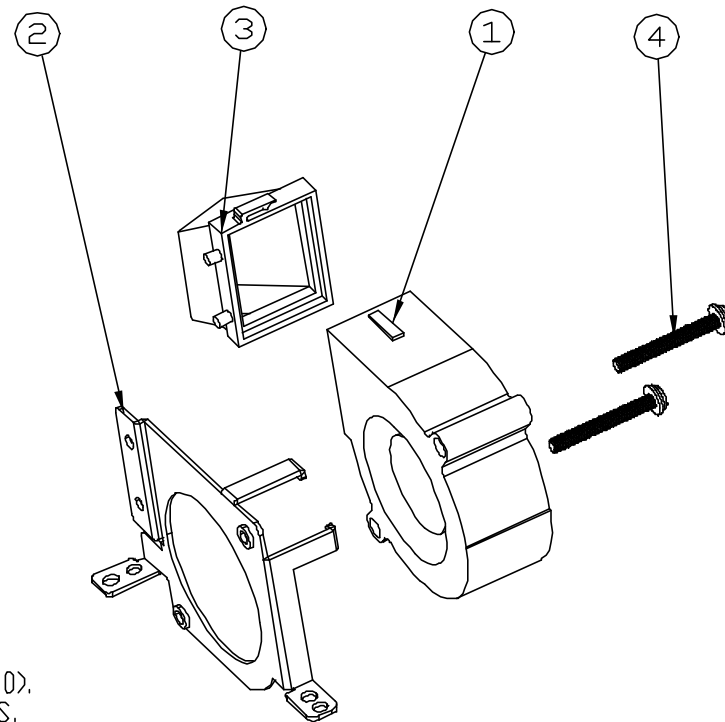
NOTES:

1. ASSEMBLING BY VENDOR :International Magnesium Tech.
2. ASSEMBLE BALLOON NO.8 AND 1 BY HEAT-MELTING.

MODEL	DX850	NAME					TOLERANCE UNLESS OTHERWISE SPECIFIED (±)									
		ASSY COVER FRONT														
DRN	Danny.Chang	2002/12/05	MATERIAL	//					CLASS	A	B	C	D	E	F	G
DSN	Danny.Chang	2002/12/05	FINISH	//					< 8mm	0.03	0.1	0.1	0.2	0.2	0.4	0.4
CKD	CalvinLee	2002/12/05	SCALE	1:1	DIM IN	mm	8 ~ 25mm	0.08	0.13	0.13	0.3	0.3	0.6	0.6		
APPD	Chris Li	2002/12/05	SHEET	1 OF 1	CAVITIES	1	25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0		
							80 ~ 250mm	0.23	0.3	0.4	0.6	0.8	1.2	1.3		
							250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0		
							> 800mm	1.0	1.0	1.3	1.7	3.0	4.0	6.0		
							ANGLE	0.5								
Beng Corporation							FILE NAME	ASSY COVER FRONT TOSHIBA								
							PART NO.	60.J5008.001								

PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5015.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	23.10090.001	BLOWER DC 12V	1
2	33.J5006.001	BKT BLOWER	1
3	42.J5020.001	NOZZLE BLOWER	1
4	36.1G524.230	SCREW	2
5	38.01033.011	ADHESIVE LOCTITE 460	0.01



NOTES:

1. ASSEMBLING BY VENDOR :Shang Bor Plastics Co.,
2. ASSEMBLE BALLOON NO.1 AND 3 BY ADHESIVE (LOCTITE 460).
ASSEMBLE BALLOON NO.1 AND 2 BY HEAT-MELTING TWO PINS.
3. BALLOON NO.1 MUST PASS FUNCTION TEST.

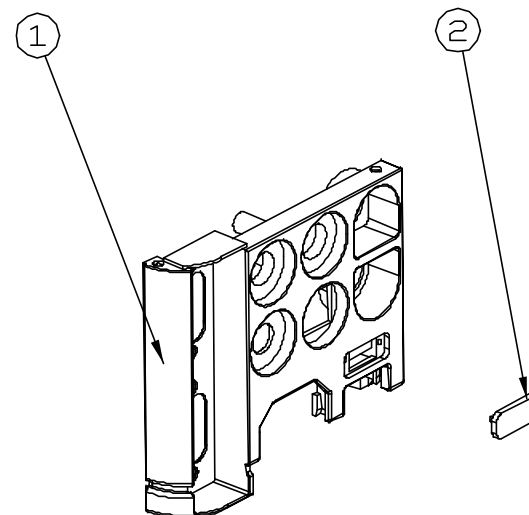
MODEL	DX850	NAME				TOLERANCE UNLESS OTHERWISE SPECIFIED (+)									
		ASSY BLOWER				CLASS	A	B	C	D	E	F	G		
						< 8mm	0.05	0.1	0.1	0.2	0.2	0.4	0.4		
DRN	Danny.Chang	2002/12/05	MATERIAL	//		8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6		
DSN	Danny.Chang	2002/12/05	FINISH	//		25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0		
CKD	CalvinLee	2002/12/05	SCALE	1 : 1	DIM IN	mm	80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2		
							250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0		
APPD	Chris Li	2002/12/05	SHEET	1 OF 1	CAVITIES	1	> 800mm	1.0	1.0	1.5	1.7	3.0	4.0		
						ANGLE	0.5								
Beng Corporation						FILE NAME	ASSY_BLOWER								
						PART NO.	60.J5015.001								

Beng Corporation



PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5023.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	30.J5005.001	CVR REAR	1
2	42.J5007.001	LENS IR	1

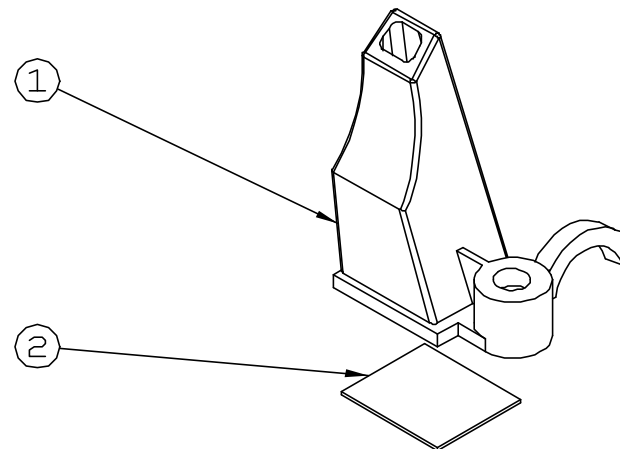


NOTES:
 1. ASSEMBLING BY VENDOR :International Magnesium Tech.
 2. ASSEMBLE BALLOON NO.1 AND 2 BY HEAT-MELTING.

MODEL	DX850	NAME					TOLERANCE UNLESS OTHERWISE SPECIFIED (+)															
		ASSY CVR REAR + CVR IR					CLASS	A	B	C	D	E	F	G								
DRN	Danny.Chang	2002/12/05	MATERIAL		//			< 8mm	0.03	0.1	0.1	0.2	0.2	0.4	0.4							
DSN	Danny.Chang	2002/12/05	FINISH		//			8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6							
CKD	CalvinLee	2002/12/05	SCALE		1:1	DIM IN	mm	25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0							
APPD	Chris Li	2002/12/05	SHEET	1 OF 1	CAVITIES	1	80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2	1.5								
							250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0								
							> 800mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0								
Beng Corporation							ANGLE								0.5							
							FILE NAME								ASSY CONN-CVR CVR-IR-REAR							
							PART NO.								60.J5023.001							

4	5		6	7		8	
PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5024.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	42.J5005.001	TUNNEL L/P	1
2	34.J5004.001	MESH TUNNEL	1
3	38.01033.011	ADHESIVE LOCTITE 460	0.01

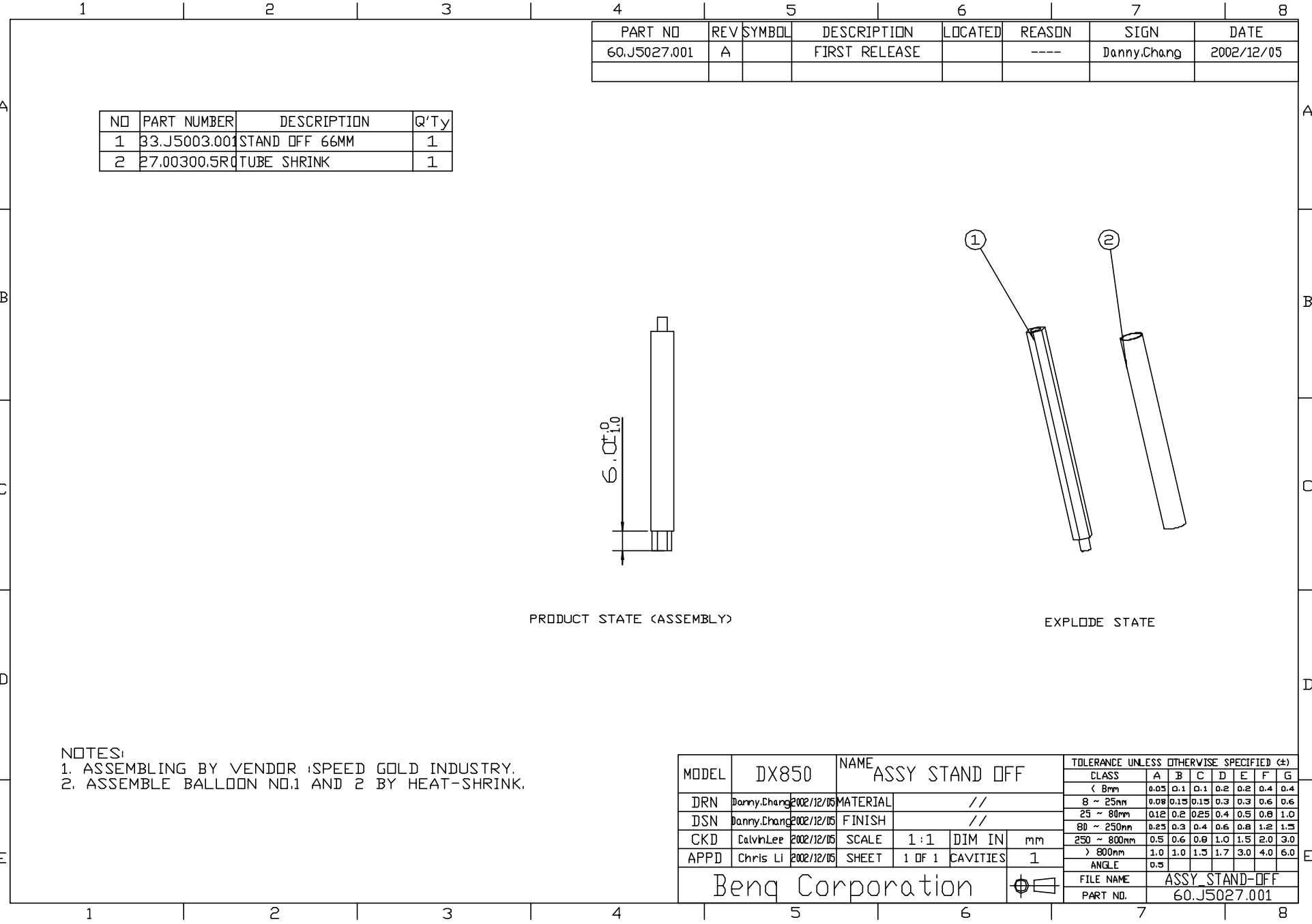


NOTES:
 1. ASSEMBLING BY VENDOR (Shang Bar Plastics Co.,
 2. ASSEMBLE BALLOON NO.1 AND 2 BY ADHESIVE (LOCTITE 460).

MODEL	DX850	NAME				TOLERANCE UNLESS OTHERWISE SPECIFIED (+)												
		CLASS	A	B	C	D	E	F	G									
		< 8mm	0.05	0.1	0.1	0.2	0.2	0.4	0.4									
DRN	Danny.Chang	2002/12/05	MATERIAL			//			8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6		
DSN	Danny.Chang	2002/12/05	FINISH			//			25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0		
CKD	CalvinLee	2002/12/05	SCALE	1 : 1	DIM IN	mm			80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2	1.5		
APPD	Chris Li	2002/12/05	SHEET	1 OF 1	CAVITIES	1			250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0		
								> 800mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0			
								ANGLE	0.5									
Beng Corporation								FILE NAME		ASSY TUNNEL								
								PART NO.		60.J5024.001								

Beng Corporation





PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5027.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	33.J5003.001	STAND OFF 66MM	1
2	27.00300.5R0	TUBE SHRINK	1

PRODUCT STATE (ASSEMBLY)

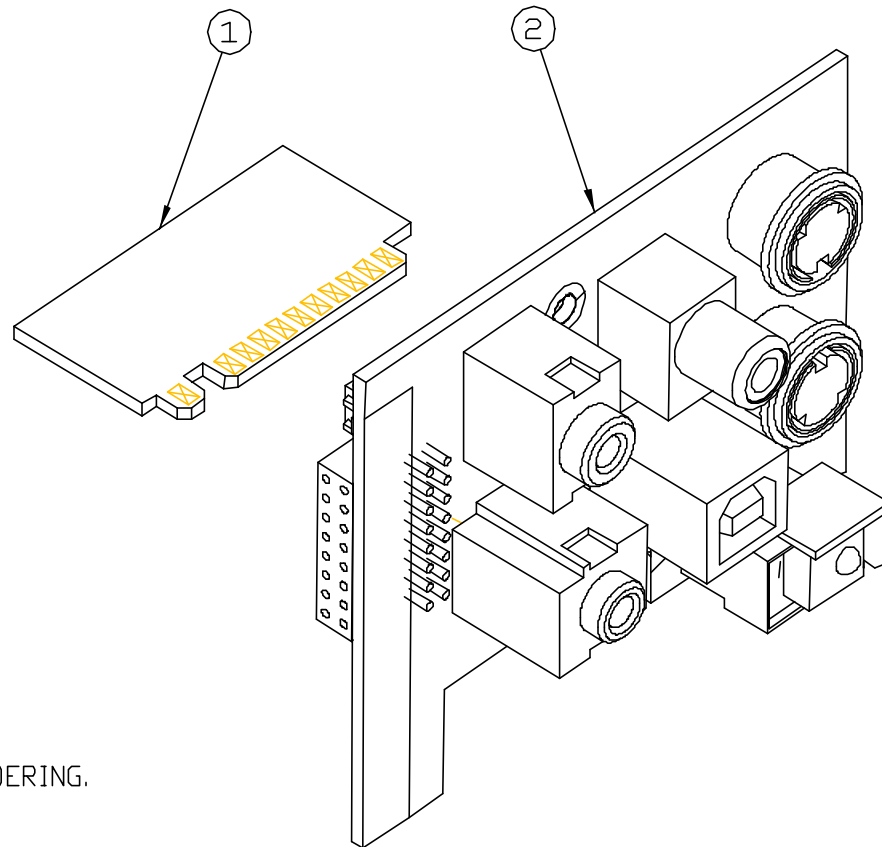
EXPLODE STATE

NOTES:
1. ASSEMBLING BY VENDOR (SPEED GOLD INDUSTRY).
2. ASSEMBLE BALLOON NO.1 AND 2 BY HEAT-SHRINK.

MODEL	DX850	NAME ASSY STAND OFF					TOLERANCE UNLESS OTHERWISE SPECIFIED (+)							
							CLASS	A	B	C	D	E	F	G
DRN	Danny.Chang	2002/12/05	MATERIAL	//			< 8mm	0.05	0.1	0.1	0.2	0.2	0.4	0.4
DSN	Danny.Chang	2002/12/05	FINISH	//			8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6
CKD	CalvinLee	2002/12/05	SCALE	1:1	DIM IN	mm	25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0
APPD	Chris LI	2002/12/05	SHEET	1 OF 1	CAVITIES	1	80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2	1.5
Beng Corporation							250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0
							> 800mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0
							ANGLE	0.5						
							FILE NAME	ASSY STAND-OFF						
							PART NO.	60.J5027.001						

1	2	3	4	5	6	7	8
PART NO	REV	SYMBOL	DESCRIPTION	LOCATED	REASON	SIGN	DATE
60.J5014.001	A		FIRST RELEASE		----	Danny.Chang	2002/12/05

NO	PART NUMBER	DESCRIPTION	Q'Ty
1	55.J5023.001	PCBA USB/BD DX850	1
2	55.J5022.001	PCBA INPUT/BD DX850	1



NOTES:
 1. ASSEMBLING BY BenQ.
 2. ASSEMBLE BALLOON NO.1 AND 2 BY TIN SOLDERING.

MODEL	DX850	NAME ASSY INPUT/B + USB/B					TOLERANCE UNLESS OTHERWISE SPECIFIED (+)									
							CLASS	A	B	C	D	E	F	G		
DRN	Danny.Chang	2002/12/05	MATERIAL		//		< 8mm	0.05	0.1	0.1	0.2	0.2	0.4	0.4		
DSN	Danny.Chang	2002/12/05	FINISH		//		8 ~ 25mm	0.08	0.15	0.15	0.3	0.3	0.6	0.6		
CKD	CalvinLee	2002/12/05	SCALE	1 : 1	DIM IN	mm	25 ~ 80mm	0.12	0.2	0.25	0.4	0.5	0.8	1.0		
APPD	Chris LI	2002/12/05	SHEET	1 OF 1	CAVITIES	1	80 ~ 250mm	0.25	0.3	0.4	0.6	0.8	1.2	1.5		
							250 ~ 800mm	0.5	0.6	0.8	1.0	1.5	2.0	3.0		
							> 800mm	1.0	1.0	1.5	1.7	3.0	4.0	6.0		
							ANGLE	0.5								
Beng Corporation									FILE NAME							
									ASSY CONNECTOR BD DX450							
									PART NO.							
									60.J5014.001							

Benq Corporation



Chapter 3 Parts replacement

3.1 Lamp module

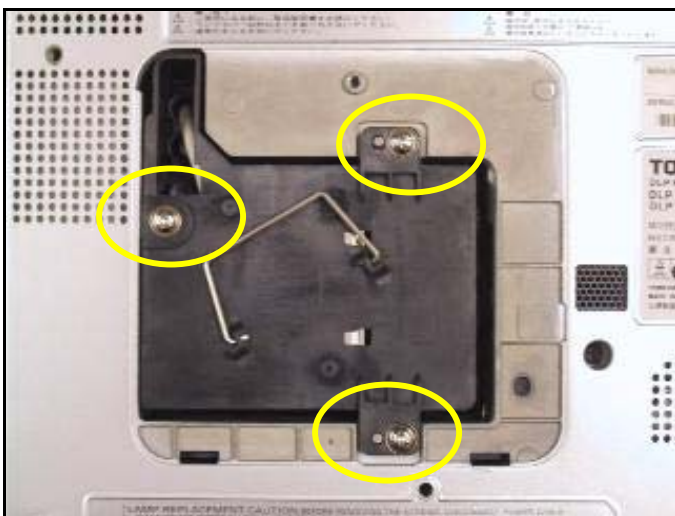
The lamp module is located at bottom of the projector. The lamp module behinds the lamp cover with 3 captive screws. After you replace the lamp module, you should reset the lamp hour counter. The switch interrupts power supply output to the projector if you remove the lamp cover.

WARNING Allow the projector to cool before removing the lamp module. The lamp module becomes very hot when the projector is in use. DO NOT touch any part of the lamp module that is located in the lamp box. Oils from your fingers will cause smudges and uneven heating of lamp surfaces, resulting in decreased image quality and premature lamp failure. If the lamp is ruptured or the lamp module is cracked or damaged, be careful of quartz or glass fragments that could cause personal injury.

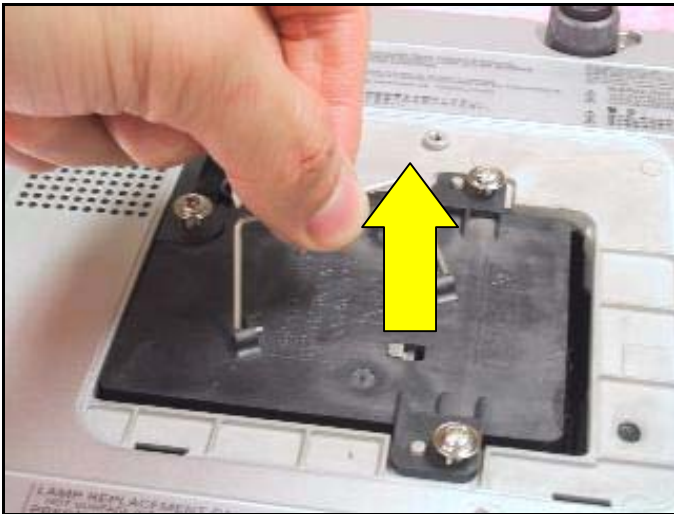
1. Remove one screw of lamp cover which is a spring door.



2. Remove the 3 screws from the lamp module.



3. Grasp the handle on the lamp module and pull the module out of the lamp box.



3.2 Top Case

The top case encloses the top half of the projector. It includes the keypad and speaker. When you just replace the top case only, you don't remove the lamp module.

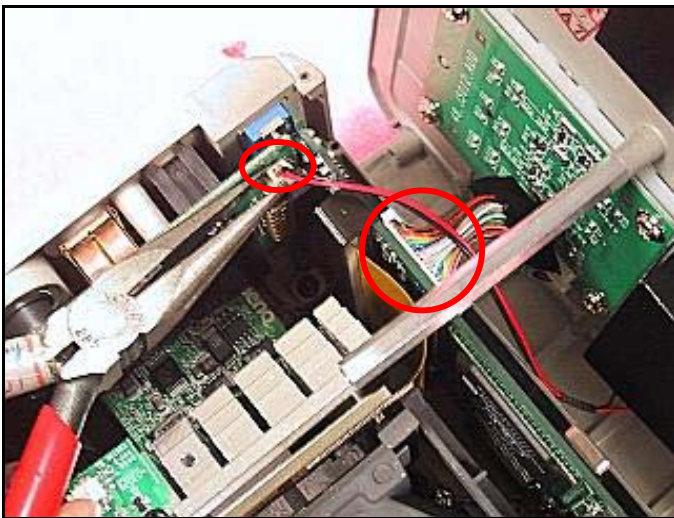
1. Remove the 4 long screws and 1 short screw.



2. Carefully turn the unit over and lift the top case from the projector.



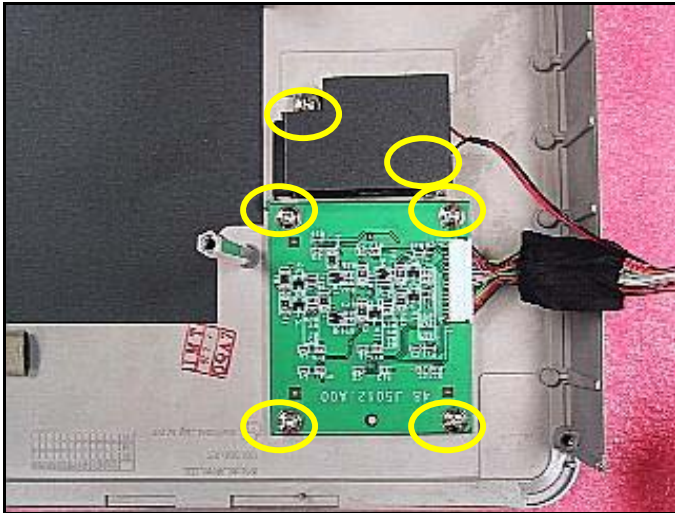
3. Place the unit upside-down on the bench and detach the keypad and speaker cable from their connector on the PC board interface.



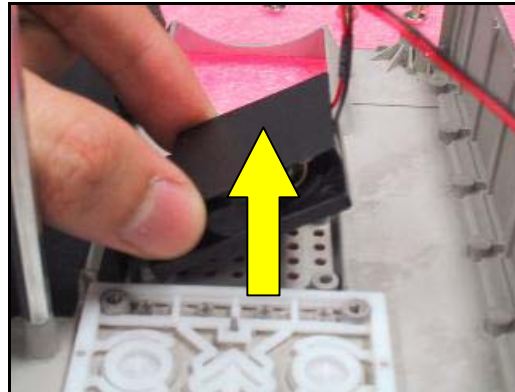
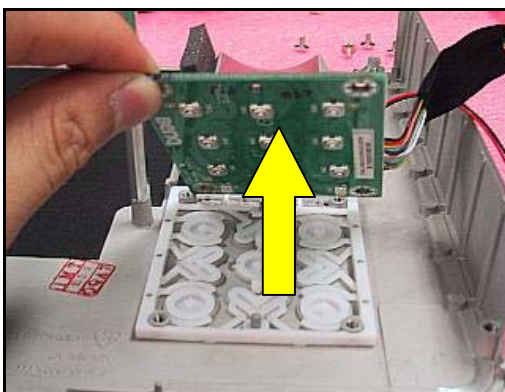
3.2.1 Keypad and Speaker

The keypad and speaker fasten to the inside of the top case with 2 cables.

1. Remove the 6 screws.



2. Lift the keypad and speaker from the top case.



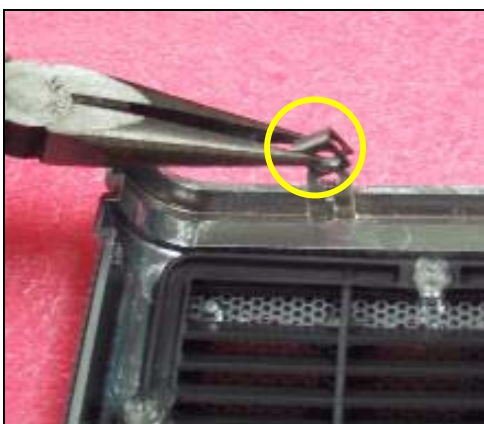
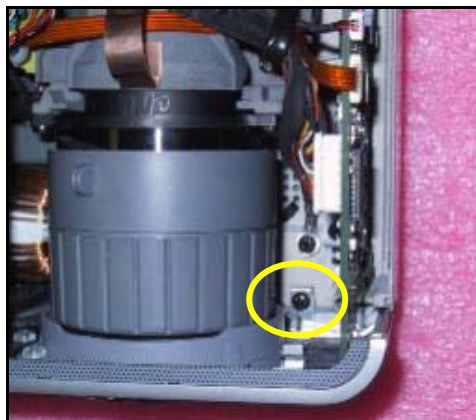
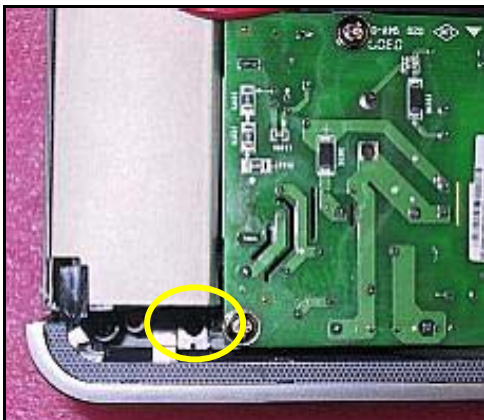
3.3 Front bezel

The front bezel covers the front of the projector and helps secure the top case to the bottom case.

1. Remove the 2 screws under the projector.



2. Remove the right and left screw of the front bezel. There is a metal upon each connector and you don't need to remove them.

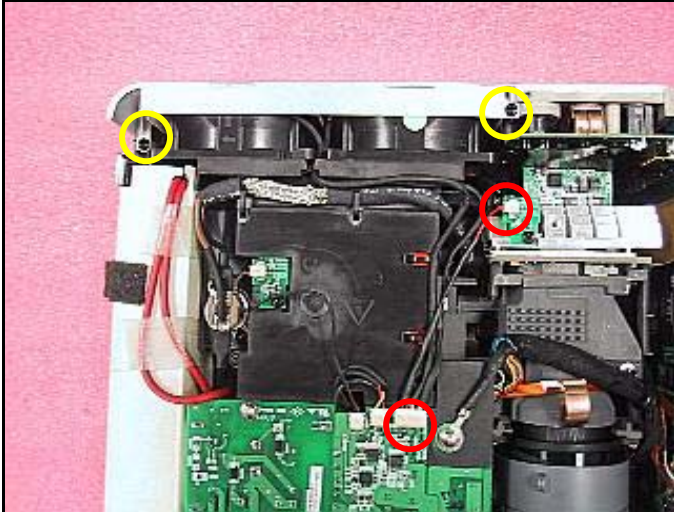


3.4 Rear Bezel

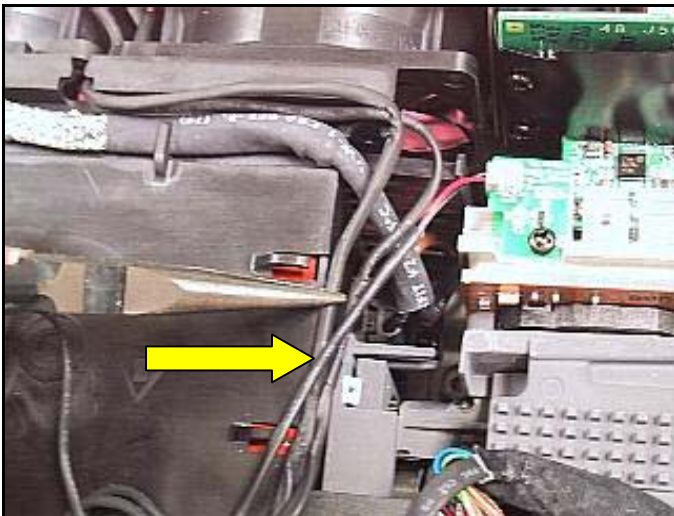
The rear bezel covers the rear of the projector and fits between the top case and the bottom case. It fastens to the 2 fans with 4 screws. You should remove 2 screws and 2 cables.

WARNING Rear bezel provides the thermal solution with 2 fans. Dust within fans will reduce the effect on heating solution.

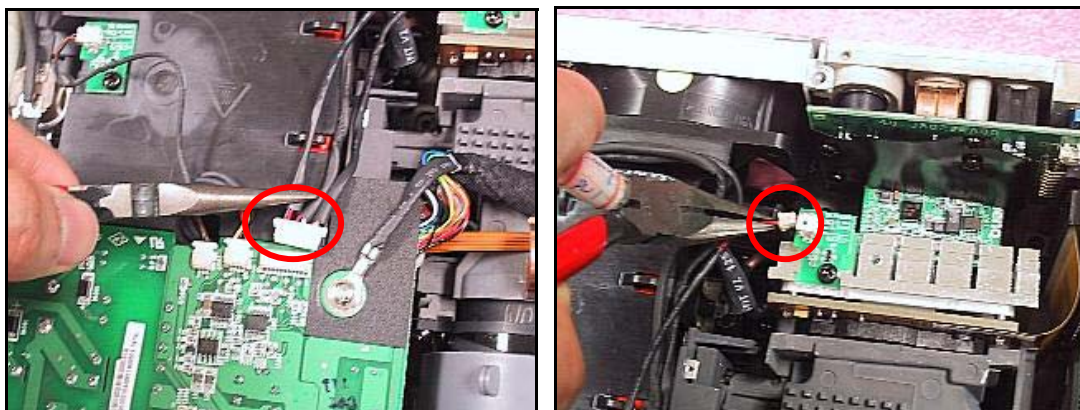
1. Remove the 2 screws.



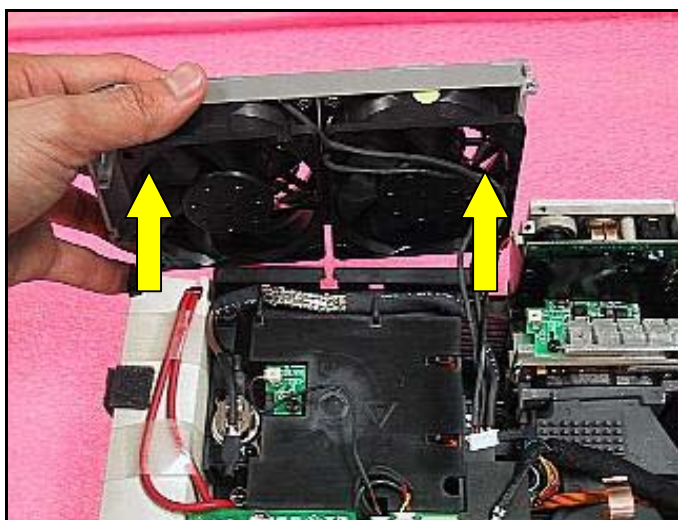
2. Place the cables out of the hooks.



3.Remove 2 cables.



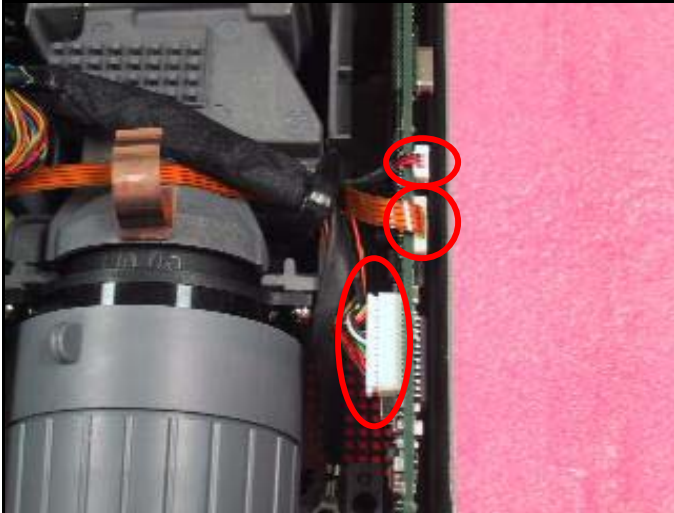
4.Lift the rear bezel.



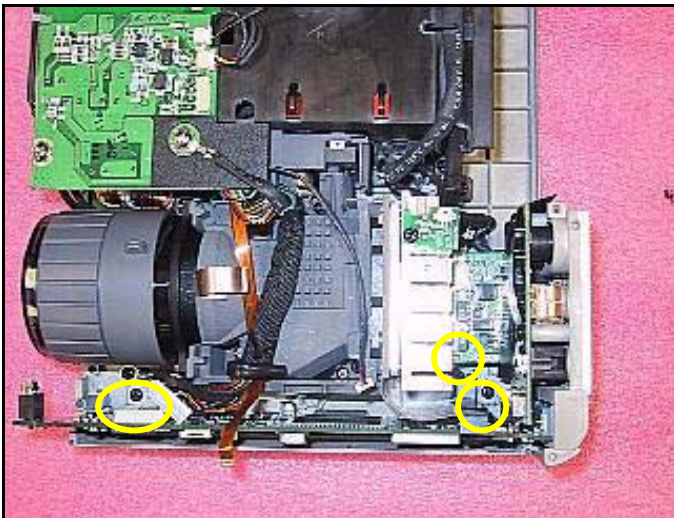
3.5 Main/Connector Module

The main/connector module is located beneath the top cover at right of the optical engine. It includes a connector cover, input board and the PC board interface.

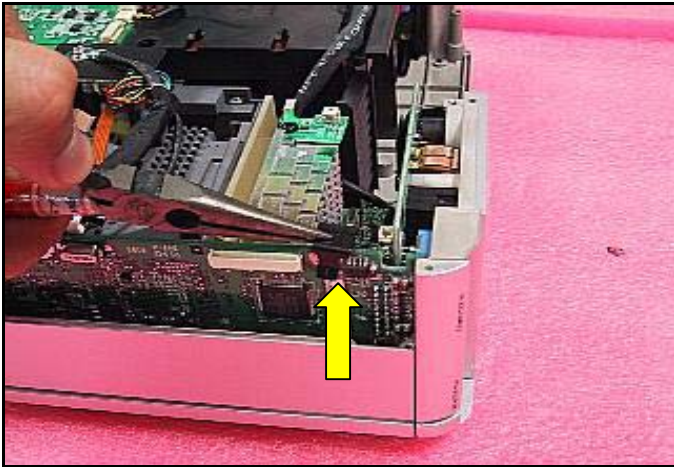
1.Remove 3 cables.



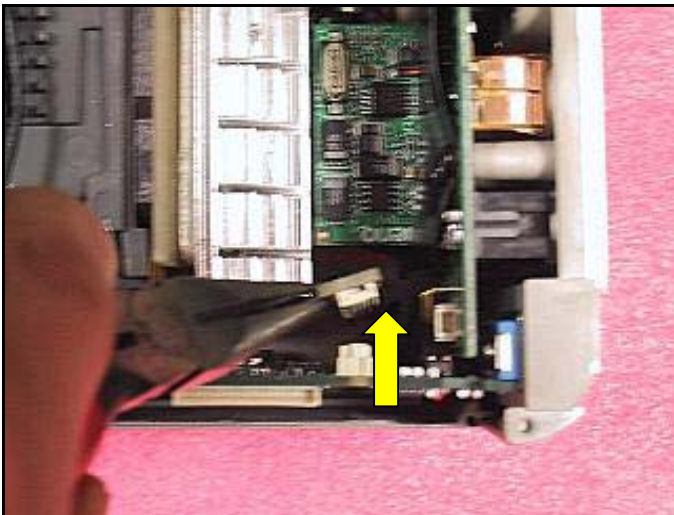
2.Remove 3 screws.



3.Lift the black metal stick from the PC board interface.



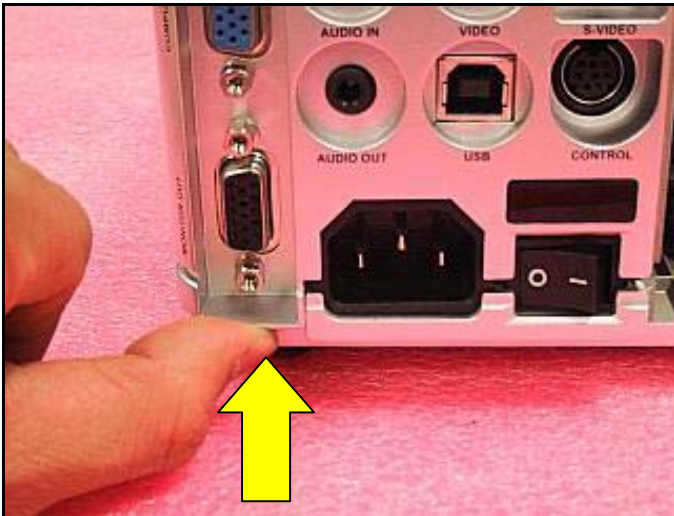
4.Lift the ZIP connector form PC board interface and DMD board.



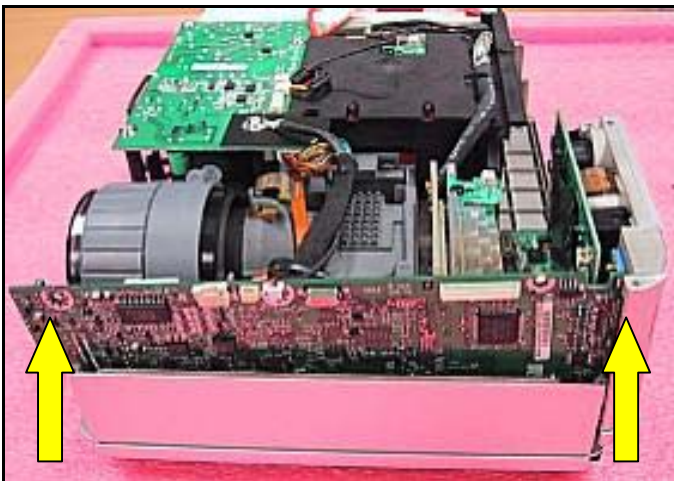
5.Remove 1 screw.



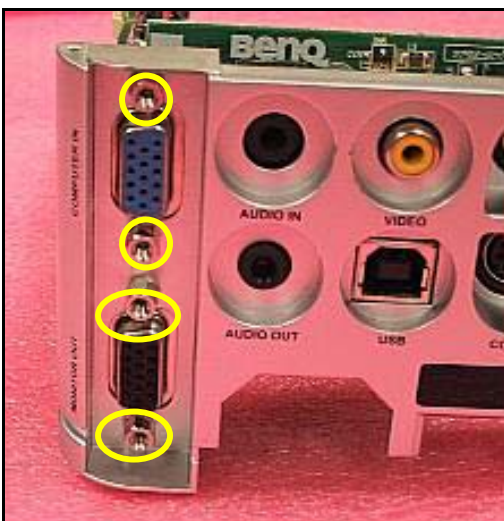
6. Lift the input rear cover.



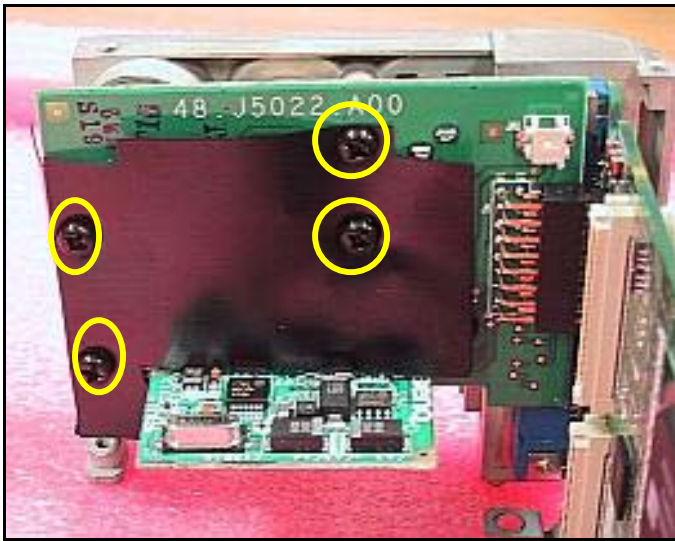
7. Lift and pull whole main/connector module.



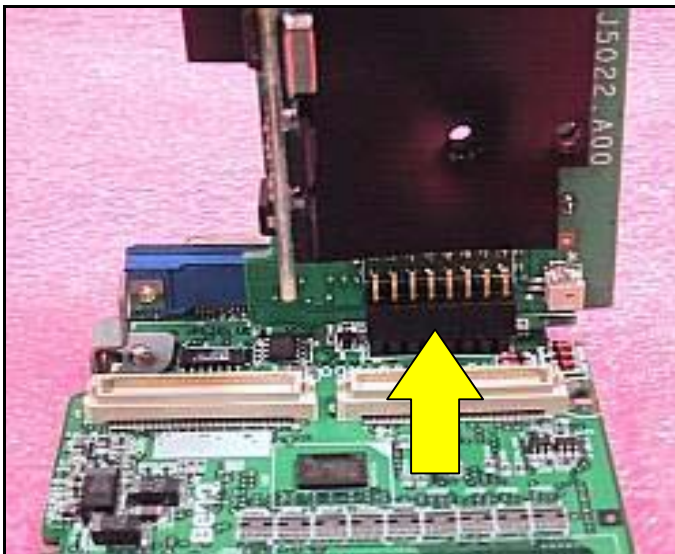
8. Remove the #4-40 jack screws from both sides of the connector.



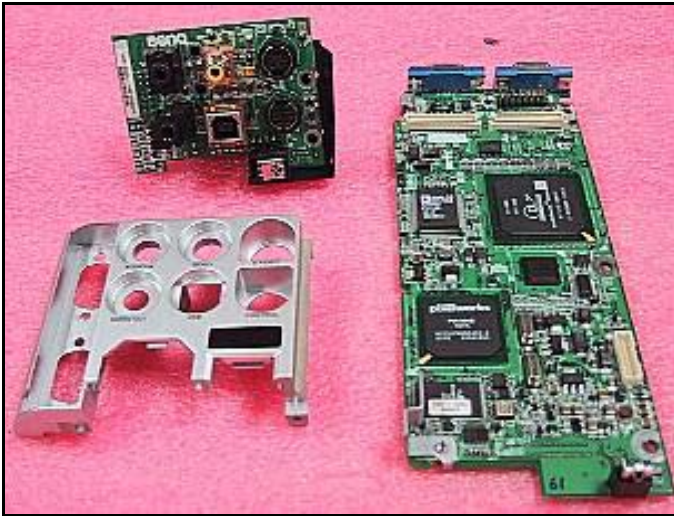
9.Remove 4 screws.



10.Separate the Input board from the PC board interface.



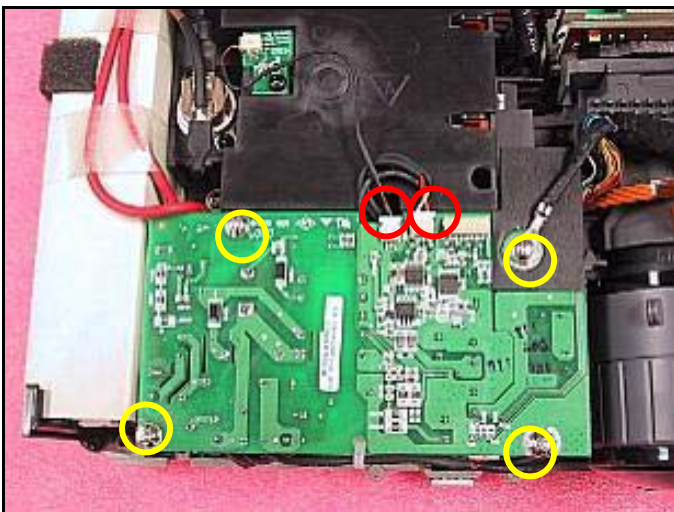
11. Thus you will get input board, PC board interface and connector cover.



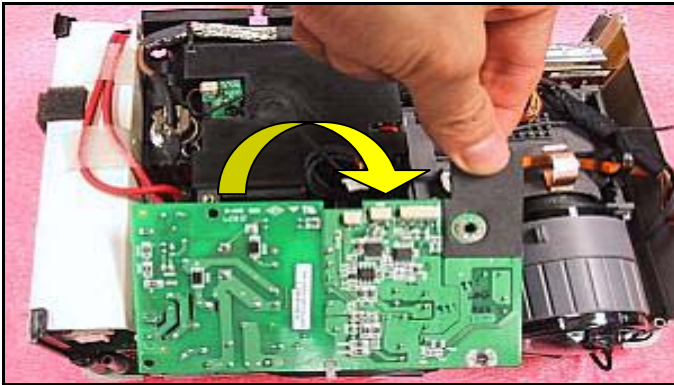
3.6 Ballast and Power Supply

The ballast is located on the side of the projector opposite the lens. The ballast receives power from the power supply, stepping it up to ignite the lamp module.

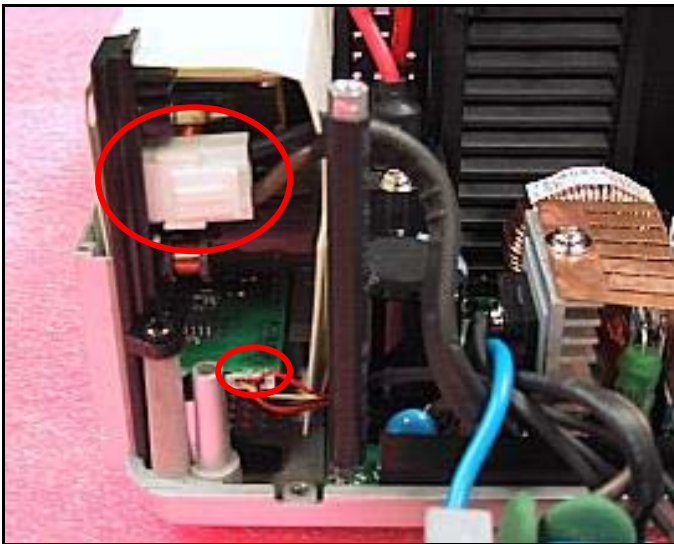
1. Remove 4 screws and 2 cables.



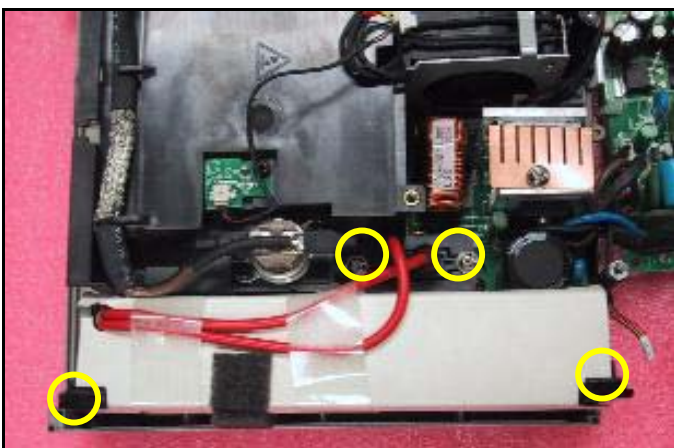
2.Lift the upper power board.



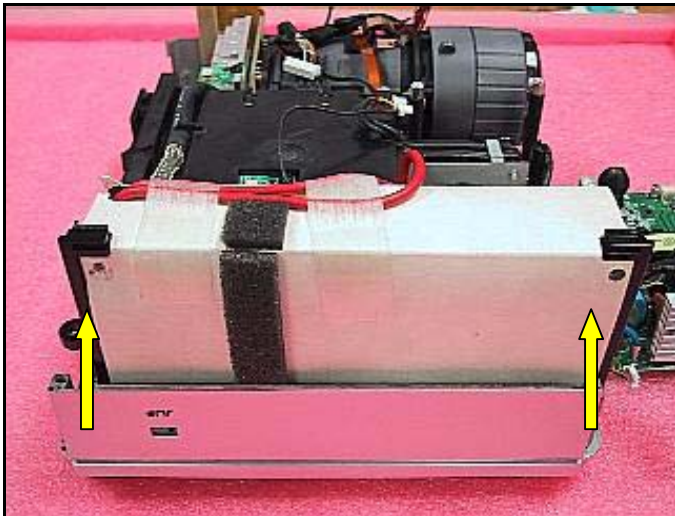
3.Remove 2 cables.



4.Remove 4 screws for ballast.



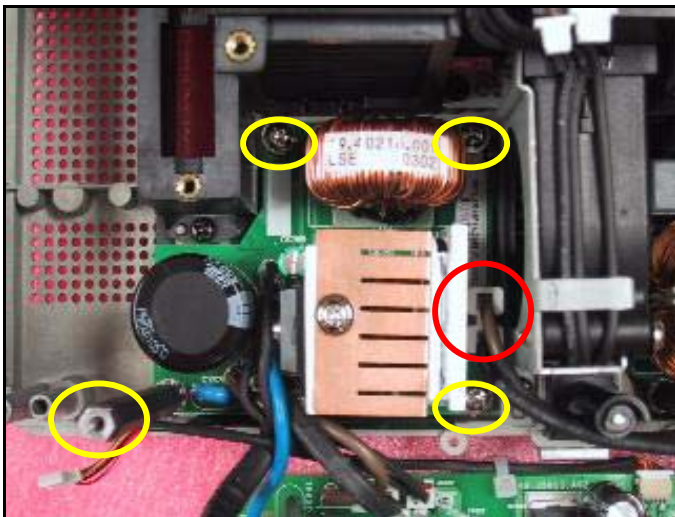
5.Lift the ballast.



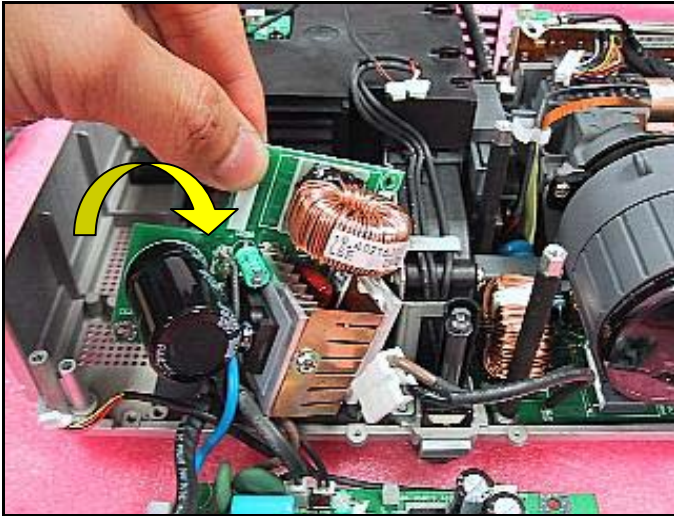
3.6.1 Power Supply

The power supply is located near the ballast at the front of the projector. It fastens to the bottom case and converts the 100-240 VAC supply voltage to various low voltage DC levels required internally by the projector. The power supply interfaces with the ballast to control lamp strike and operation and to detect the electrical condition of the safety interlock switch.

1.Remove 3 screws , 1 jack screw and 1 cable.



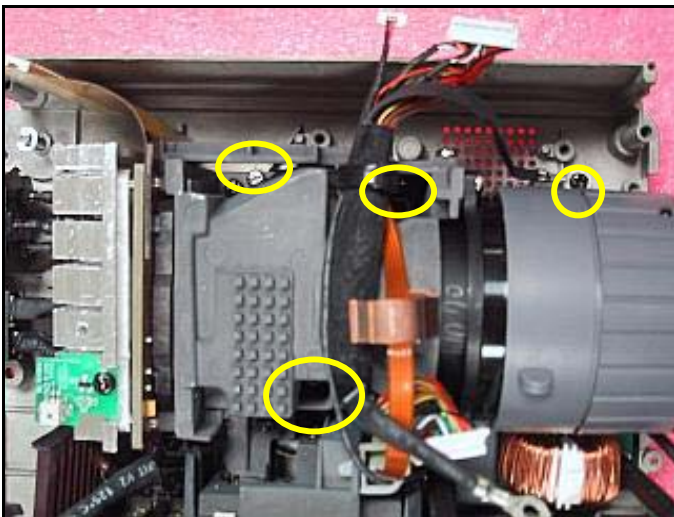
2.Lift the power supply board.



3.7 Optical Engine

The optical engine is located beneath the main/connector board at the side of the projector opposite the ballast. It fastens to the bottom case and produces the projected image by directing focused light from the lamp module through the color wheel and onto the Digital Micromirror Device (DMD).

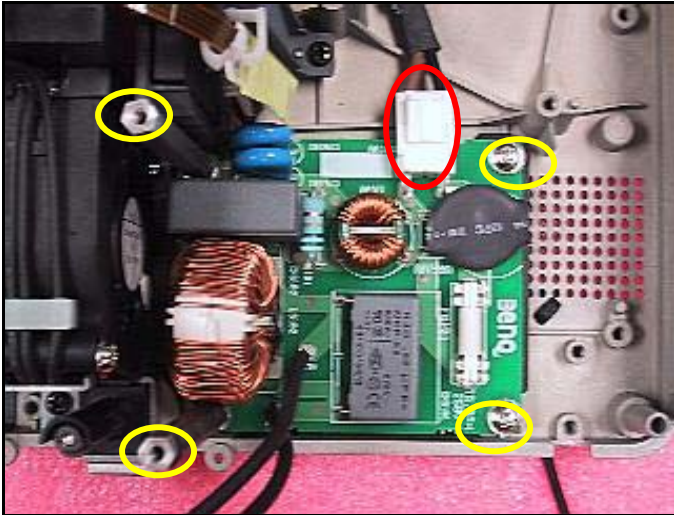
1.Remove 3 screws for optical engine and 1 screw for cable.



3.8 EMI Board

The EMI board fastens to the power supply under the optical engine. It drains electro-magnetic interference away from AC inlet.

1.Remove 2 screws, 2 jack screws and 1 cable.



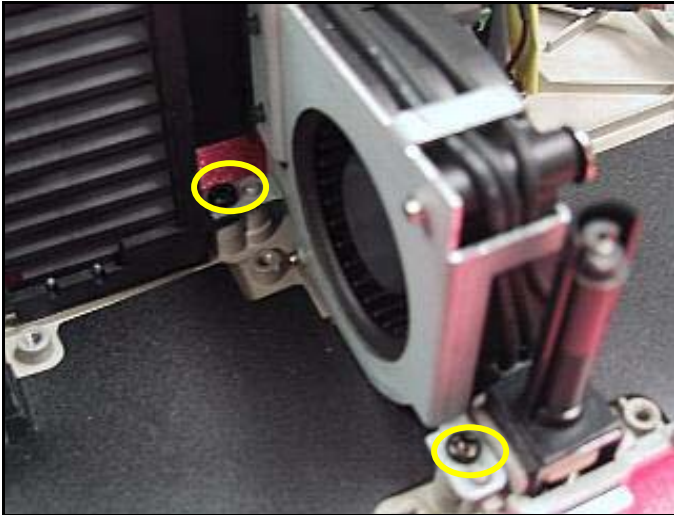
2.Lift EMI board.



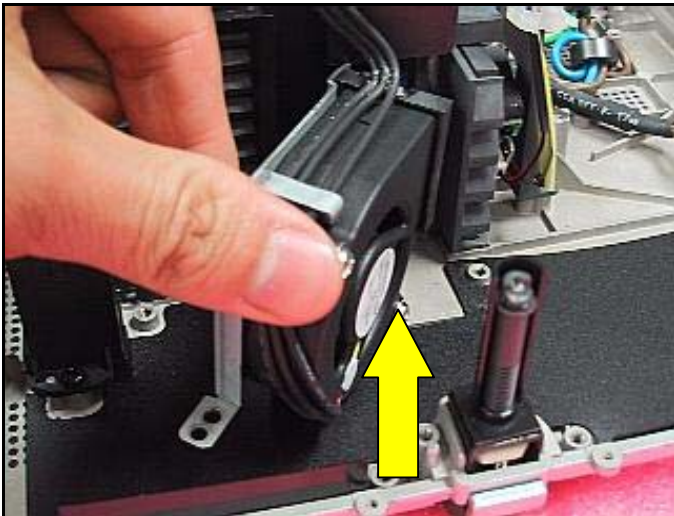
3.9 Lamp Blower

The lamp blower is fastens to lamp box on the bottom case. The blower directs cool air around the lamp.

1.Remove 2 screws.



2.Lift lamp blower.



3.10 Foot Adjust

The foot adjust is located in the bottom case. The foot adjust stick slides up or down through the bottom case to raise or lower the front of the projector when you press the actuator button on the side of the bottom case.

1.Remove 1 screw.



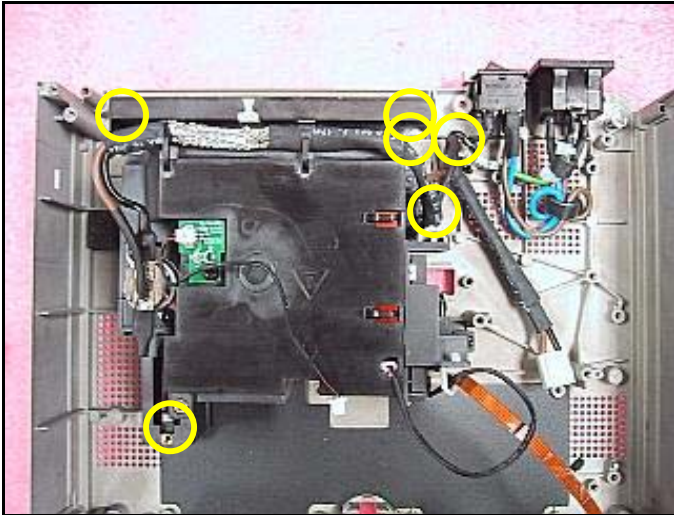
2. Pull the release latch of the foot adjust outward to disengage the connection between the foot adjust and the bottom case.



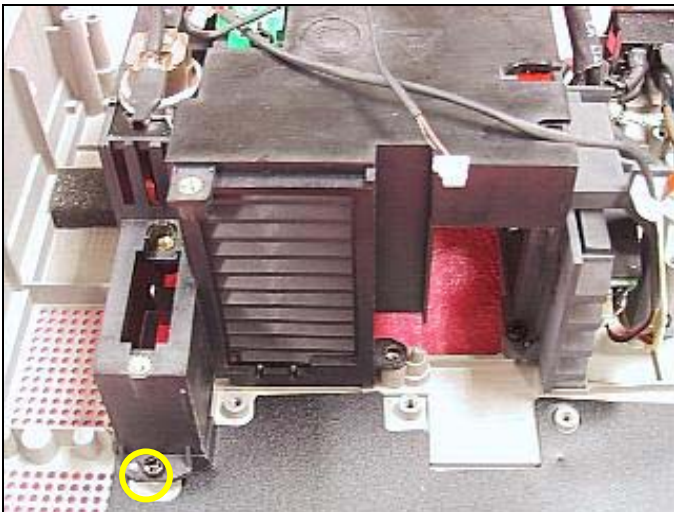
3.11 Lamp Box

The lamp box is fastens to AC inlet/thermal switch/power switch. It helps secure the lamp module to the bottom case.

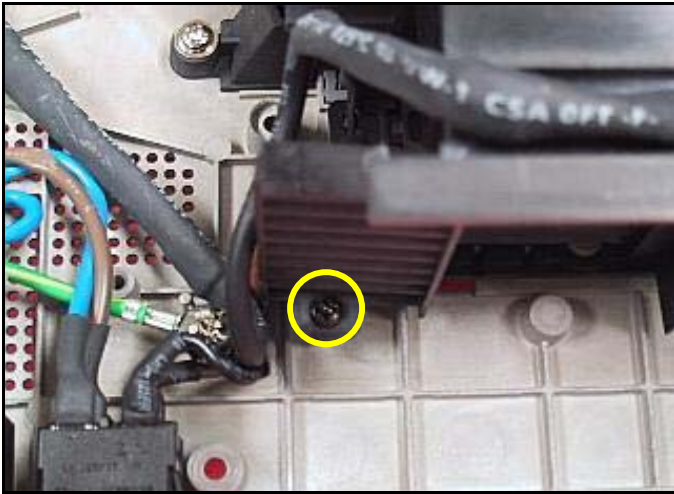
1. There are 6 screws you need to remove.



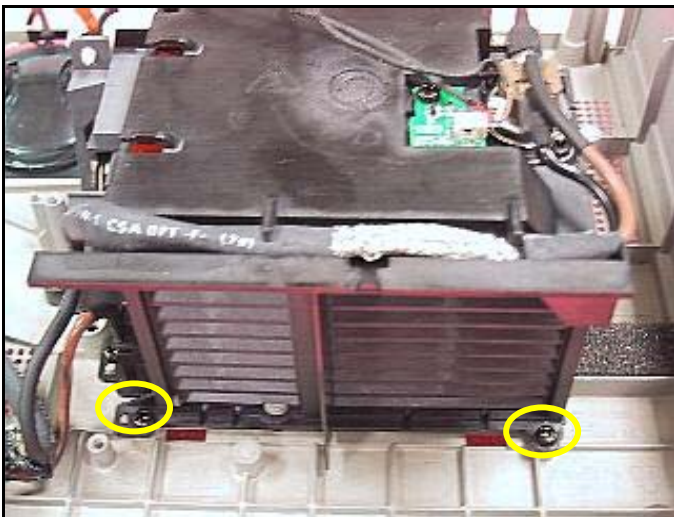
2. Remove 1 screw in front of the lamp box.



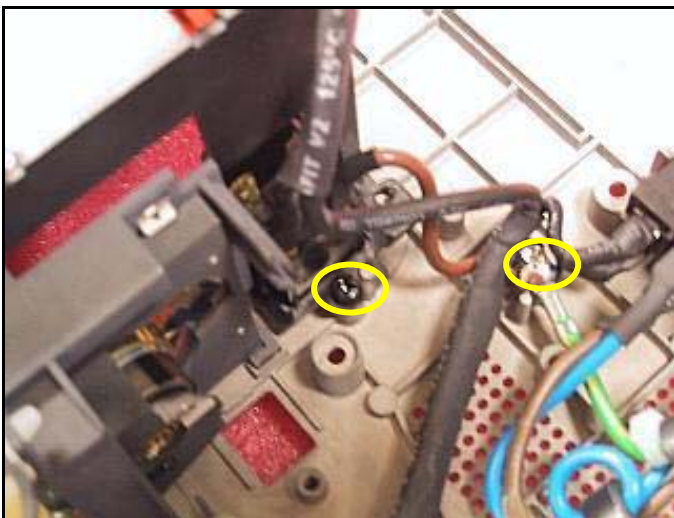
3. Remove 1 screw and pick up the portion of lamp box.



4. Remove 2 screws.



5. Remove 1 screw for lamp cover switch and remove 1 screw for AC inlet cable.

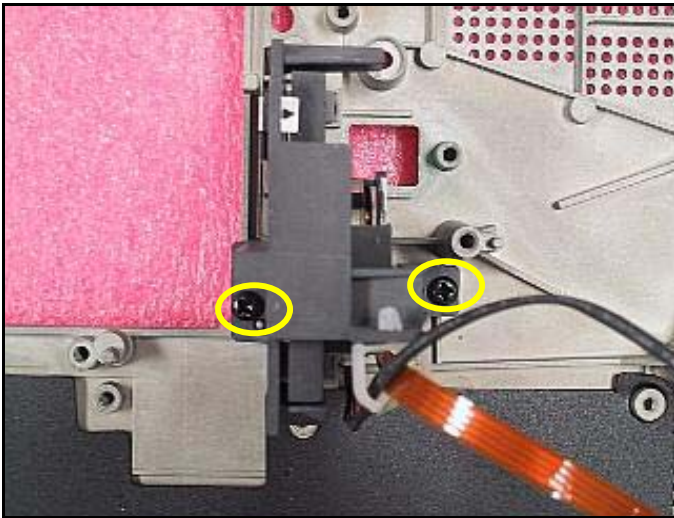


3.12 Color Wheel Module

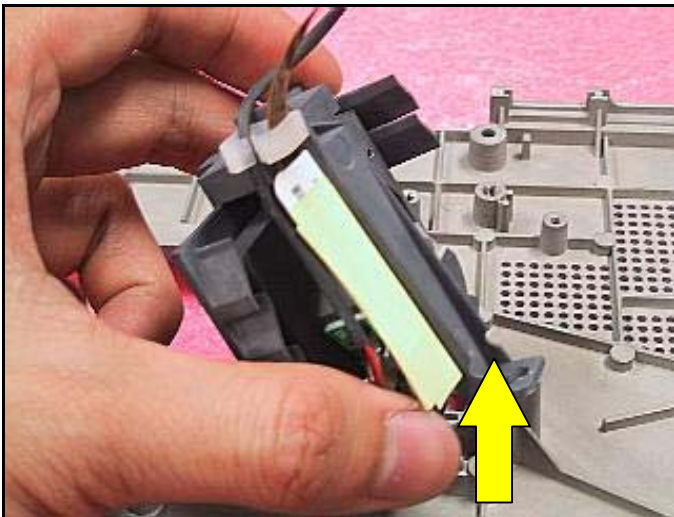
The color wheel module is located on bottom case between lamp box and optical engine.

CAUTION The color wheel is in the color wheel module. Take extreme care not to bump it with a tool or press against it because it is very delicate. Avoid any touching on color wheel and dust causes image quality decreasing. A broken color wheel requires engine replacement.

1. Remove 2 screws.

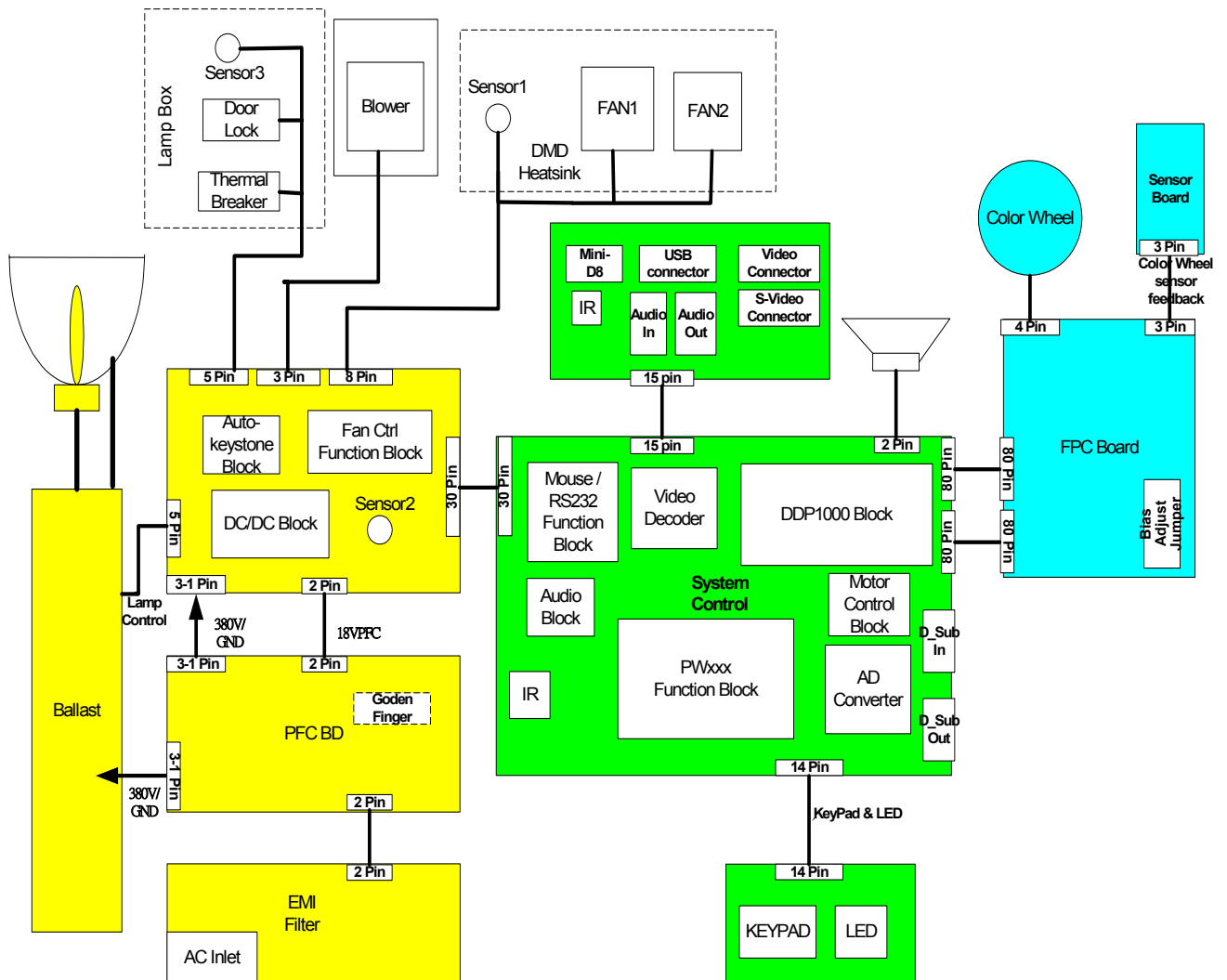


2. Carefully pull and lift the color wheel module from the bottom case.

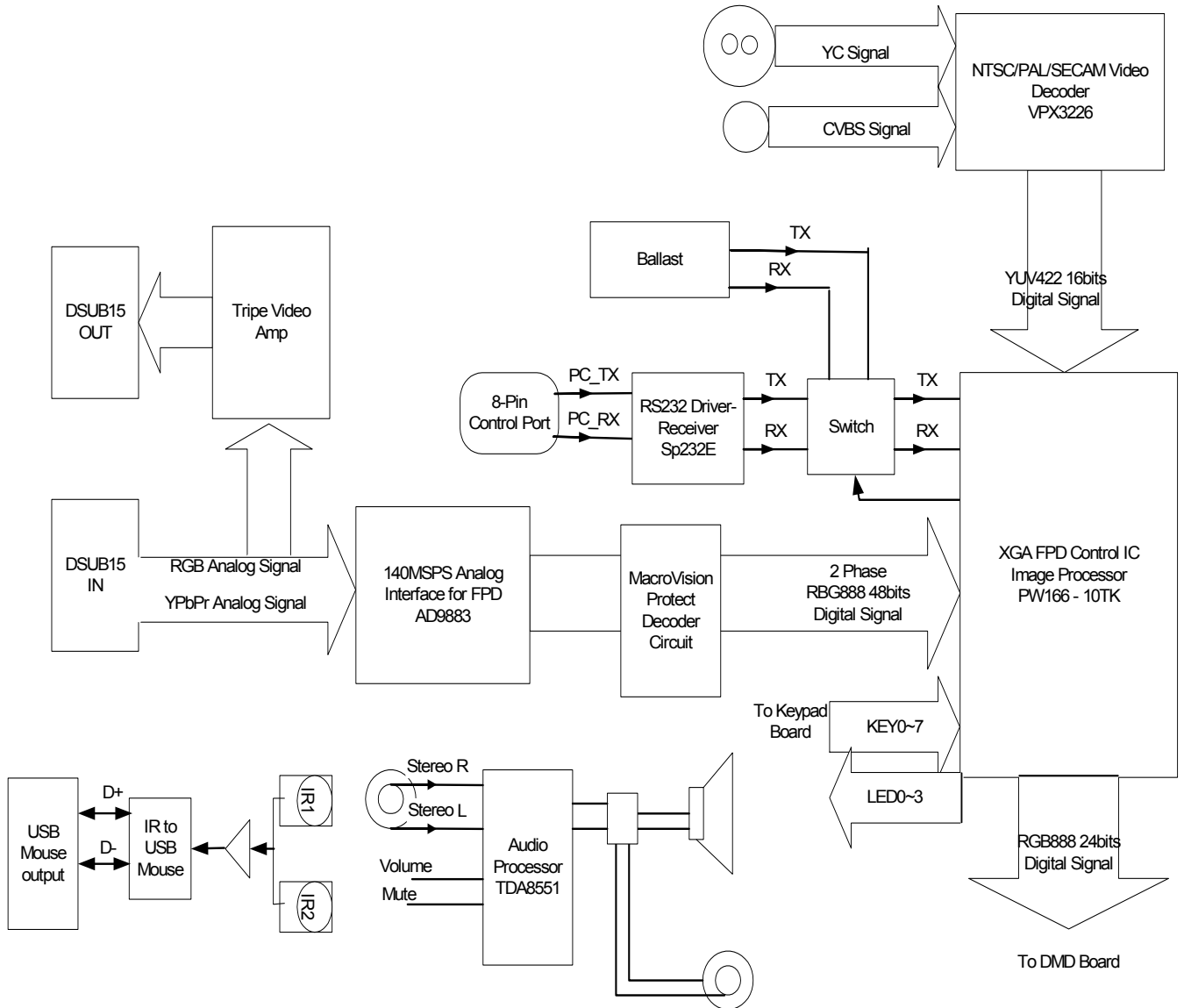


Chapter 4 Block diagram

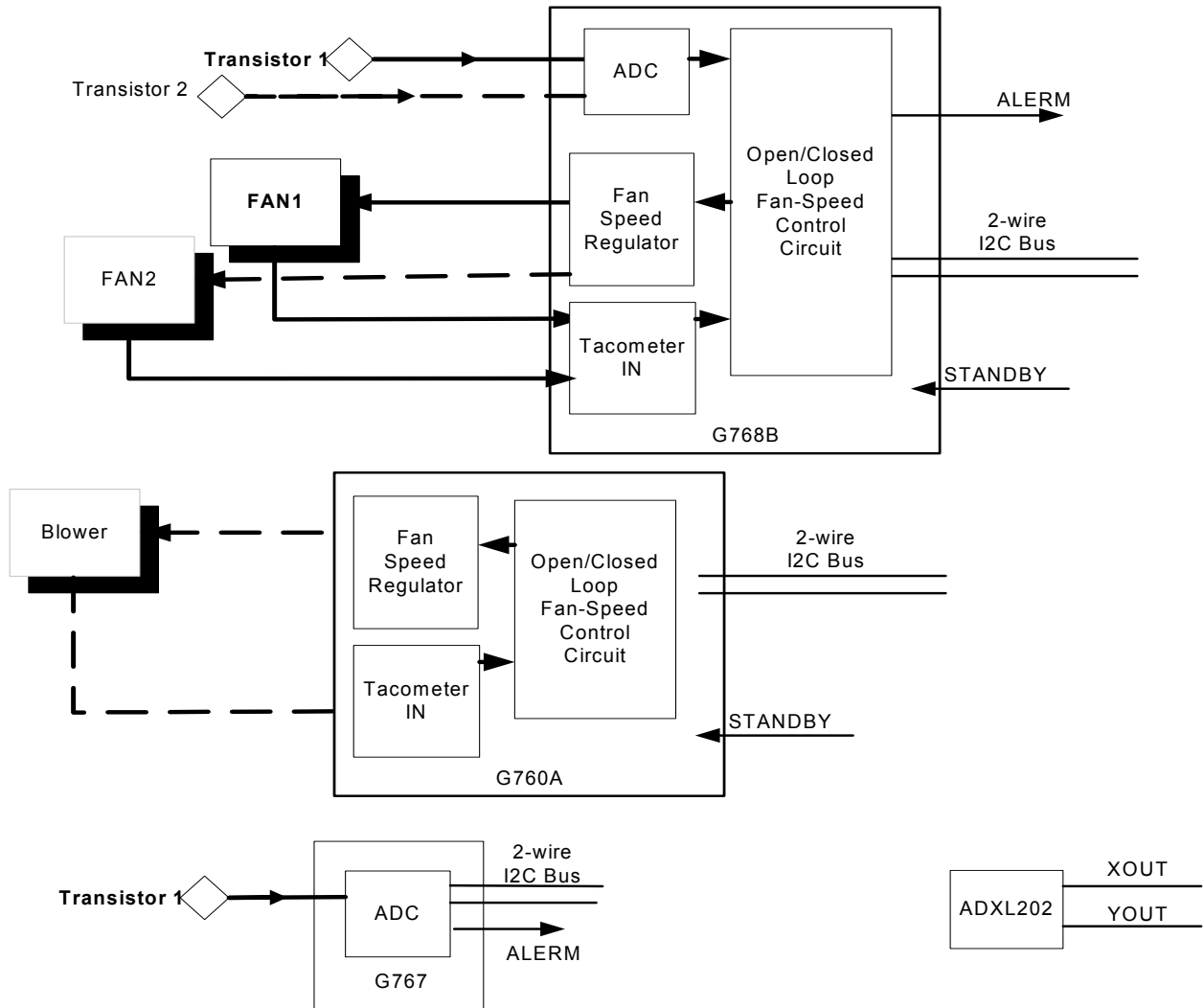
System Structure



Block Diagram





Fan Control Auto Keystone



Chapter 5 Trouble shooting guide

The indicator lights inform you of internal abnormalities.

<p>ON LAMP TEMP FAN</p> <p>○ ○ ○ ○</p>	<p>No power</p> <p>⇒ Problem with projector</p> <ul style="list-style-type: none"> • Unplug the power cord, and contact your dealer. <p>⇒ The lamp cover is not properly attached.</p> <ul style="list-style-type: none"> • Unplug the power cord, and reattach the lamp cover.
<p>ON LAMP TEMP FAN</p> <p>(Red lit) (Red lit) ○ ○</p>	<p>Lamp went out during use, or won't come on</p> <p>⇒ The abnormal indication of the LED continues for about 1 minute then the projector returns to standby mode after cooling for a while. If the projector fails to operate normally after turning the power back on, either the lamp needs replacing, or there is a problem with the projector.</p> <ul style="list-style-type: none"> • If a lamp burns out, replace it with a new one. • Unplug the power cord, and contact your dealer.
<p>ON LAMP TEMP FAN</p> <p>(Red lit) ○ (Red lit) (Green lit)</p> <p>↑</p> <p>Or (Orange lit)</p>	<p>Power went out during use, or power won't come on</p> <p>⇒ Internal overheating, or the outside temperature is too high.</p> <ul style="list-style-type: none"> • Place the projector so that the air intake and exhaust are not blocked. • Unplug the power cord and wait for a short while, then turn the power back on. • Clean the air filter. <p>✱ The  icon will appear before the power goes out.</p> <p>✱ The abnormal indication of the LED continues for about 1 minute then the projector returns to standby mode after cooling for a while.</p>
<p>ON LAMP TEMP FAN</p> <p>(Red lit) ○ ○ (Red lit or flashing)</p> <p>↑</p> <p>Or (Orange lit)</p>	<p>Power went out during use, or power won't come on</p> <p>⇒ Problem with internal cooling fan.</p> <ul style="list-style-type: none"> • Unplug the power cord, and contact your dealer. <p>✱ The  icon will appear before the power goes out.</p> <p>✱ The abnormal indication of the LED continues for about 1 minute then the projector returns to standby mode after cooling for a while.</p>

PRECAUTIONS

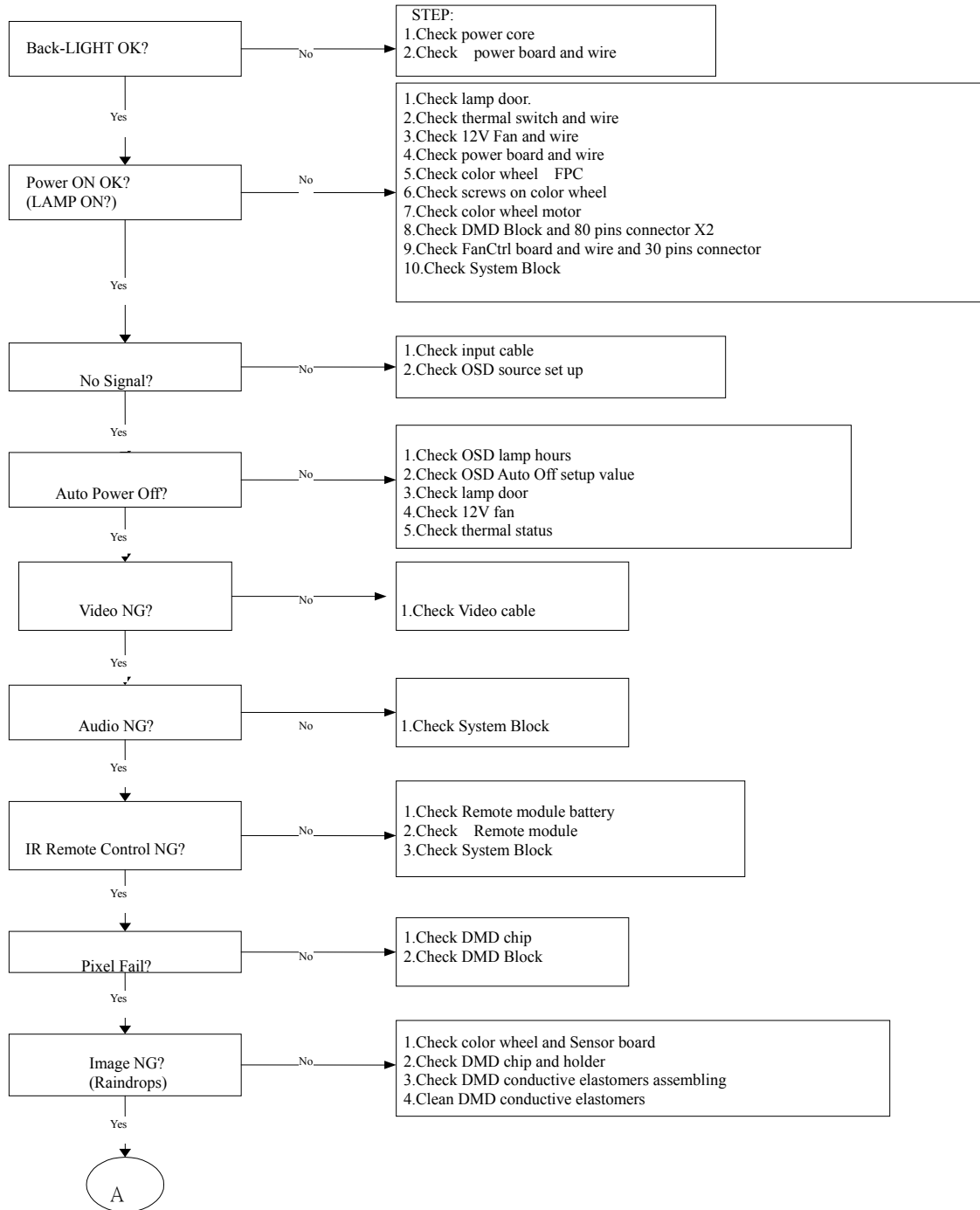
- Make sure to unplug the power cord if something goes wrong.
- If the power cord is unplugged before cooling is complete, give the lamp time (about 10 minutes) to cool before plugging it back in. If the lamp overheats it may fail to light. Unplugging the power cord repeatedly when the temperature is high will shorten the life of the lamp. (Even if you are not concerned about lamp lifetime, the light may not come on if you do not wait at least 3 minutes.)

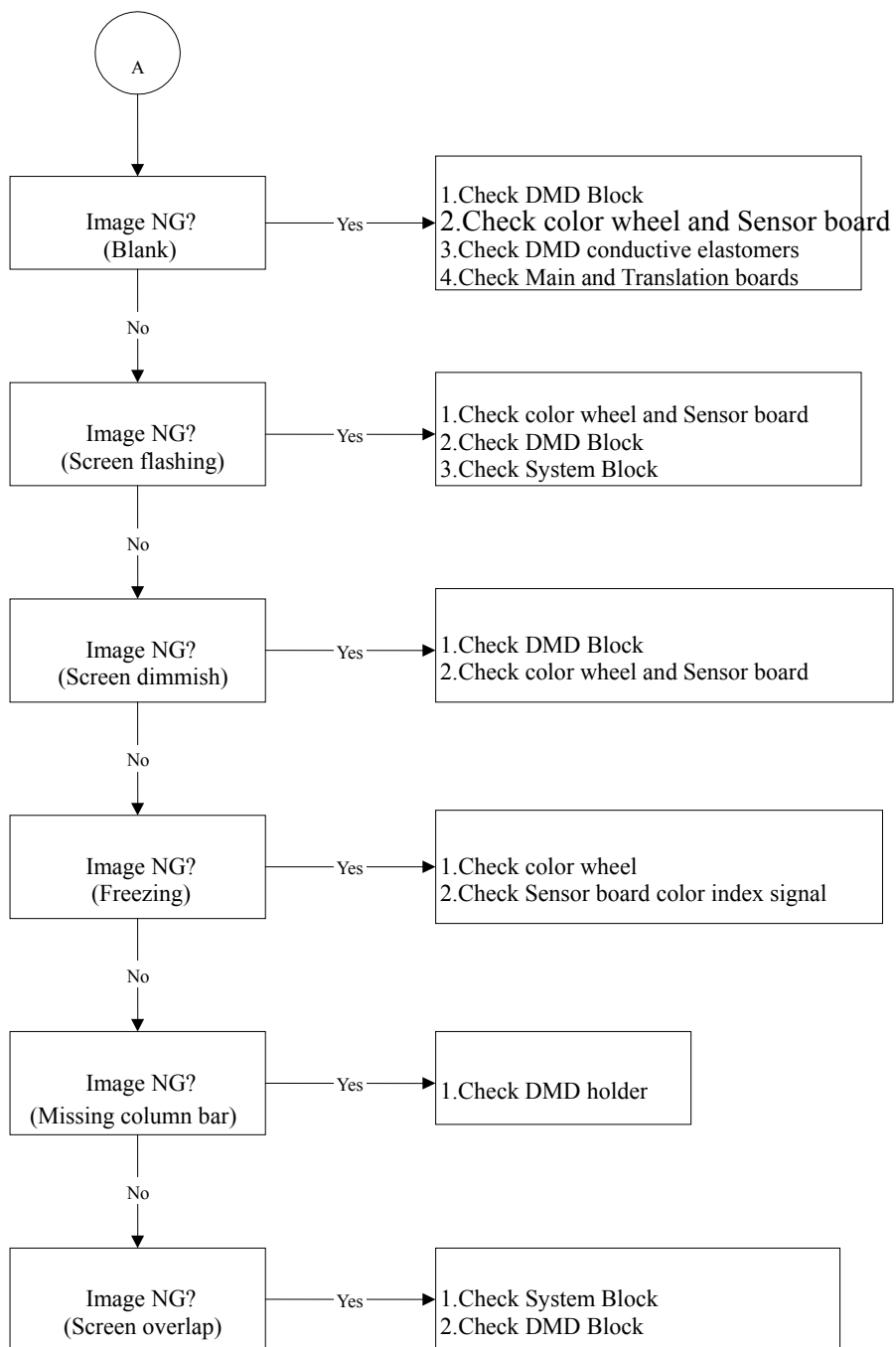
If you think something is wrong, check the following before contacting customer service. Please see **“Trouble indications”** as well.

If This Happens	Check
No power	<ul style="list-style-type: none"> • Is the power cord plugged in? Is it connected to the projector? • Is the lamp cover loose?
Power goes out during use	<ul style="list-style-type: none"> • Is the ambient temperature high? • Is the air intake or air exhaust blocked?
No picture	<ul style="list-style-type: none"> • Is the input source selecting properly? • Is the mute function on? • Is the brightness setting minimized? • Are the connections set up correctly? • Are all the connected devices functioning properly?
No audio	<ul style="list-style-type: none"> • Is a plug inserted to AUDIO OUT terminal? • Is the mute function on? • Is the volume setting minimized? • Are the connections set up correctly? • Are all the connected devices functioning properly?
Picture not displayed correctly	<ul style="list-style-type: none"> • Is the input signal supported by the projector? • Is the correct video mode selected? • Is the correct signal format selected? • Is the selecting of computer or Y/P_B/P_R input correct? • Is there something generating an abnormal video signal, for instance the video tape?
Picture blurred Part of picture out of focus	<ul style="list-style-type: none"> • Is the lens dirty? • Is the lens focus adjusted optimally? • Is the projection distance within the projector's supported range? • Is the projector's screen placement angle tilted too far? • Are the sharpness or sampling phase adjustments off?
Image is dark	<ul style="list-style-type: none"> • Are the brightness or contrast adjustments off? • Is the lamp nearing the end of its service life?
Colors too light Bad shading	<ul style="list-style-type: none"> • Are the color, tint, R-level, G-level, or B-level adjustments off? • Is the screen dirty? • Is the lamp nearing the end of its service life?
Remote control doesn't work	<ul style="list-style-type: none"> • Are the remote control's batteries drained? • Are the batteries inserted into the remote control correctly? • Is the remote control being used within the effective range? • Are there any obstructions between the remote control and projector? • Are there any fluorescent or other bright lights shining at the projector's infrared remote sensor?

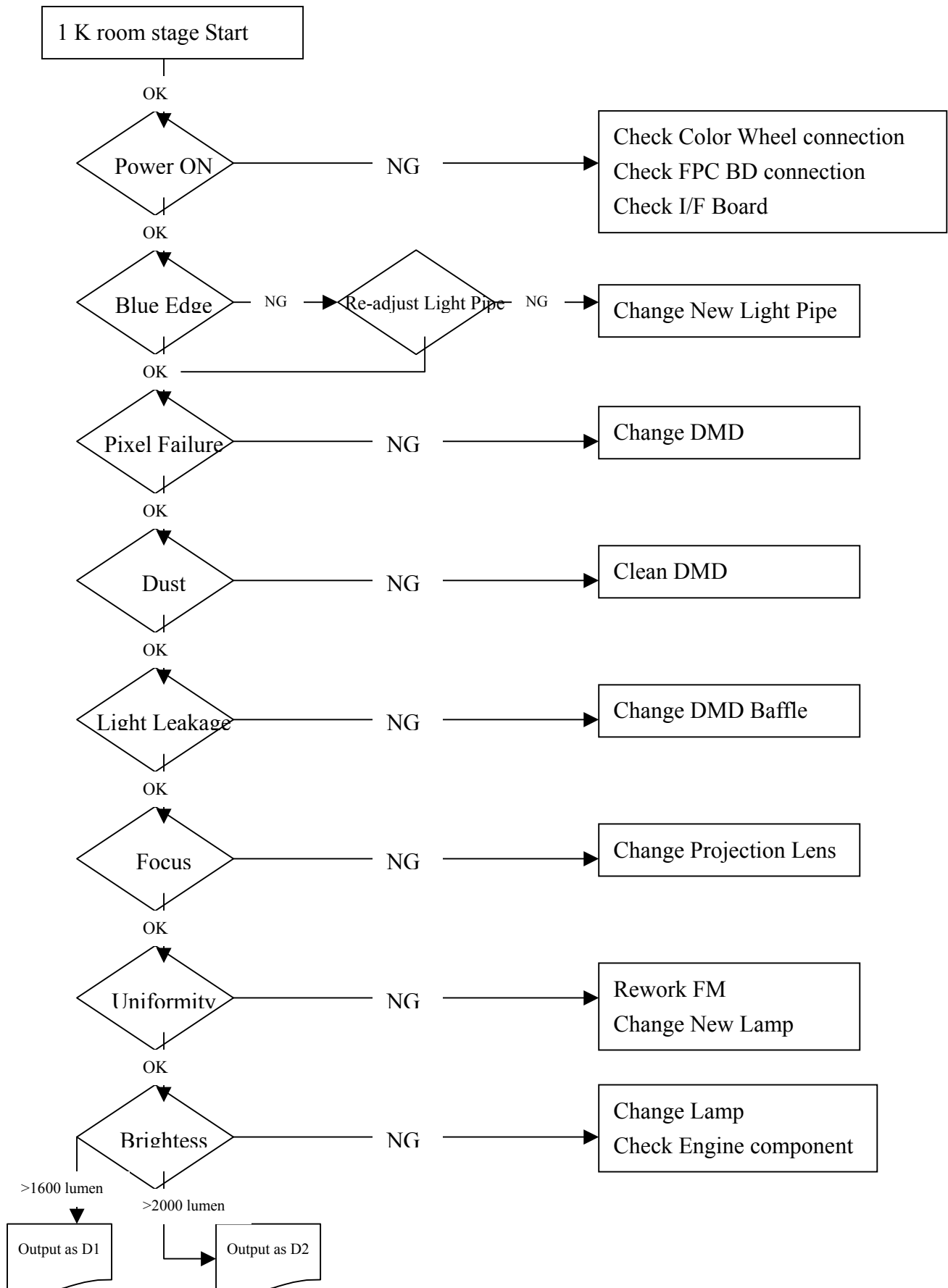
1. Final Assembly Trouble Shooting Guide

System Trouble Shooting Flow Char

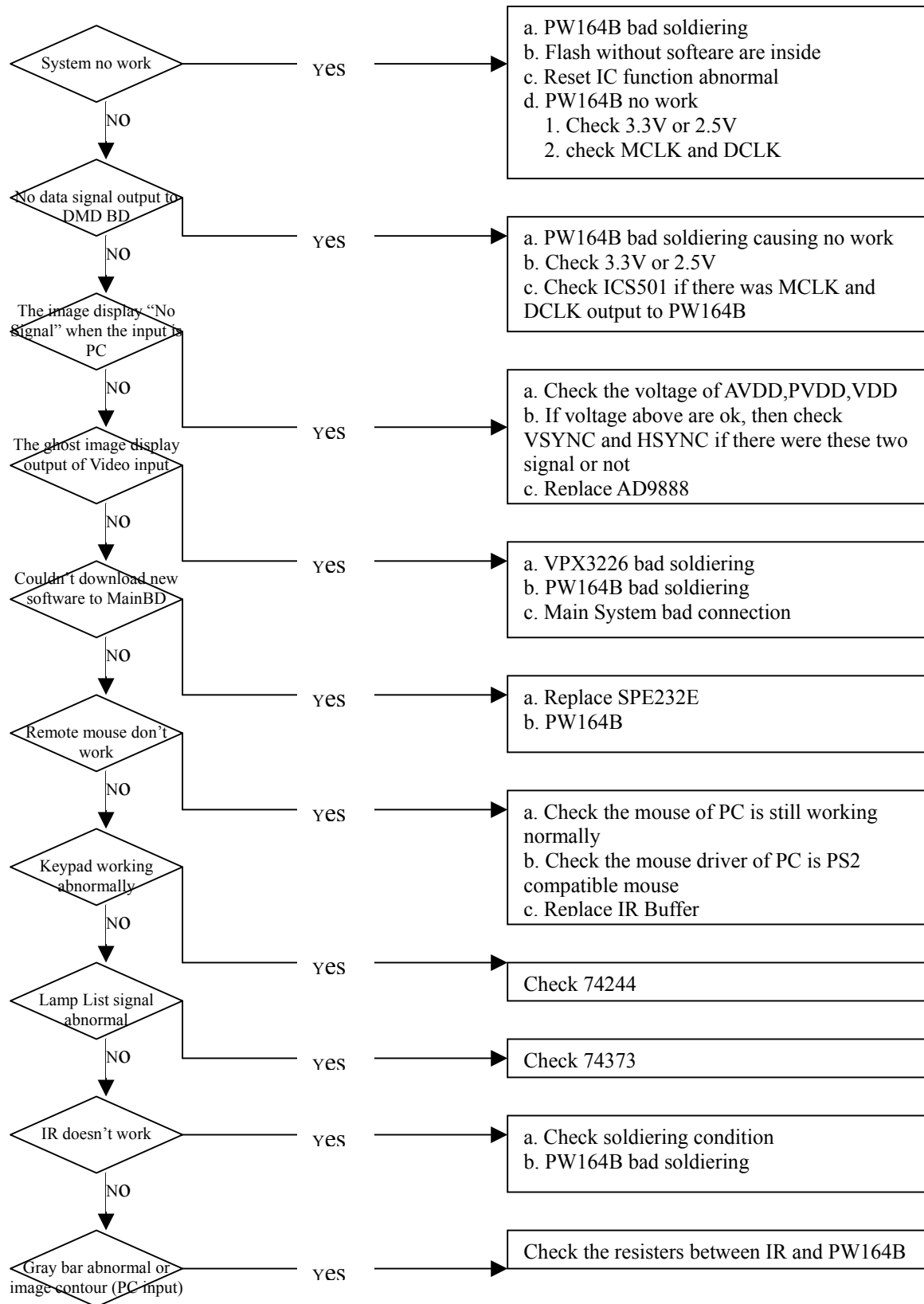




2. Engine Assembly Trouble Shooting Guide

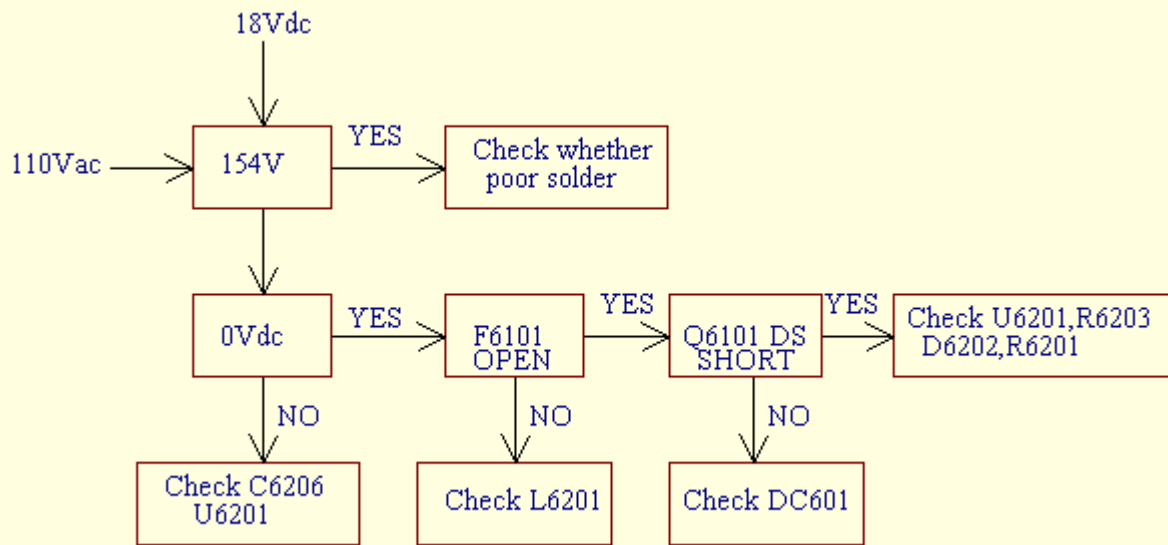


3. Main Block Trouble Shooting Guide

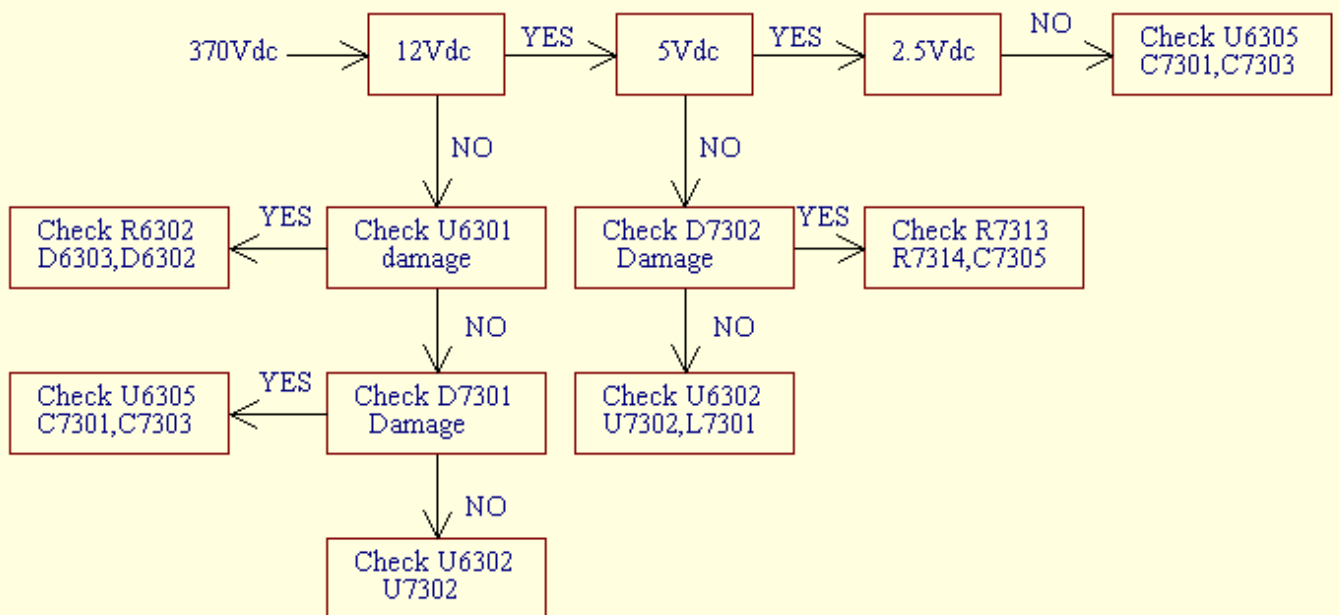


4. Power Supply Trouble Shooting Guide

PFC BOARD

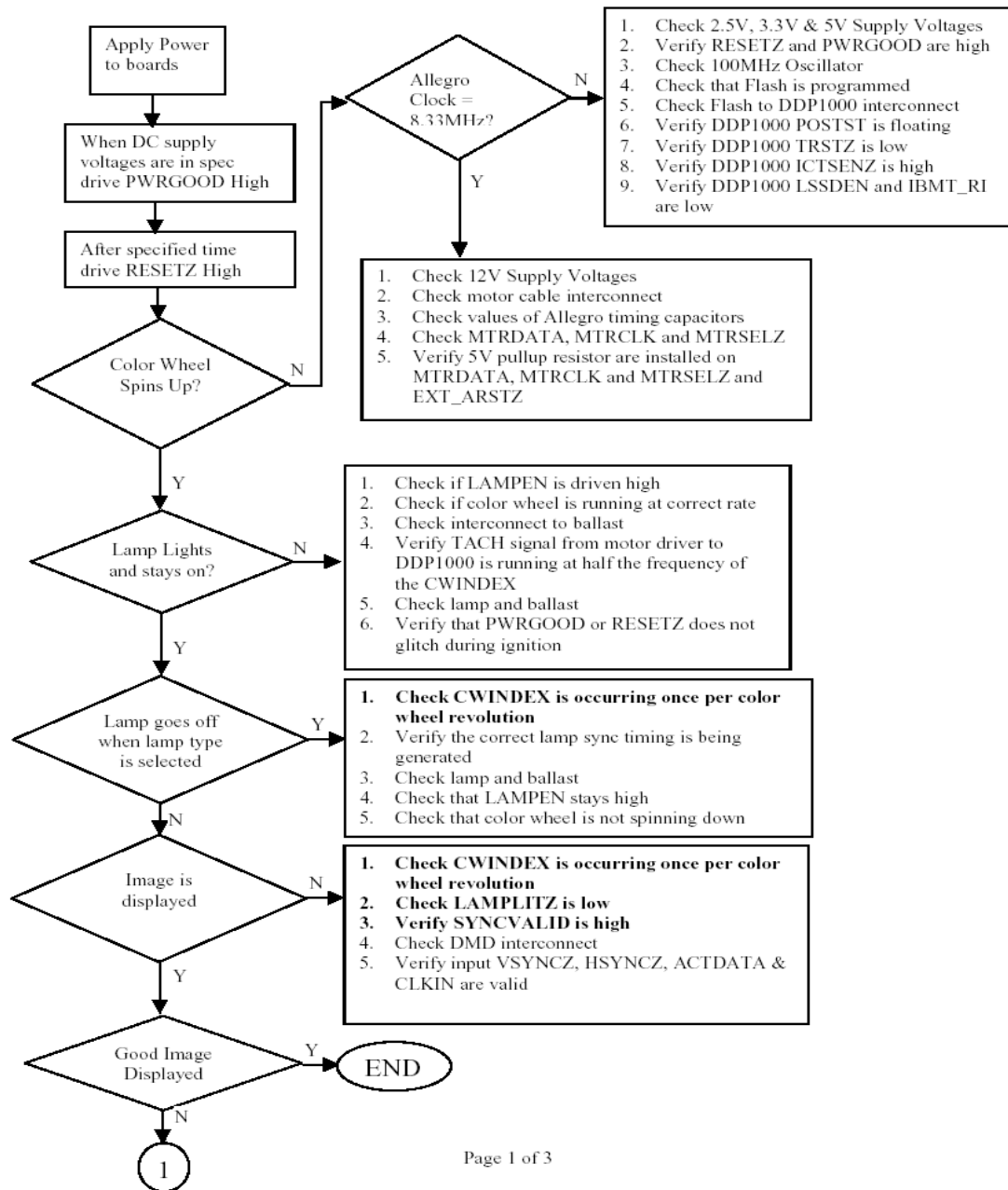


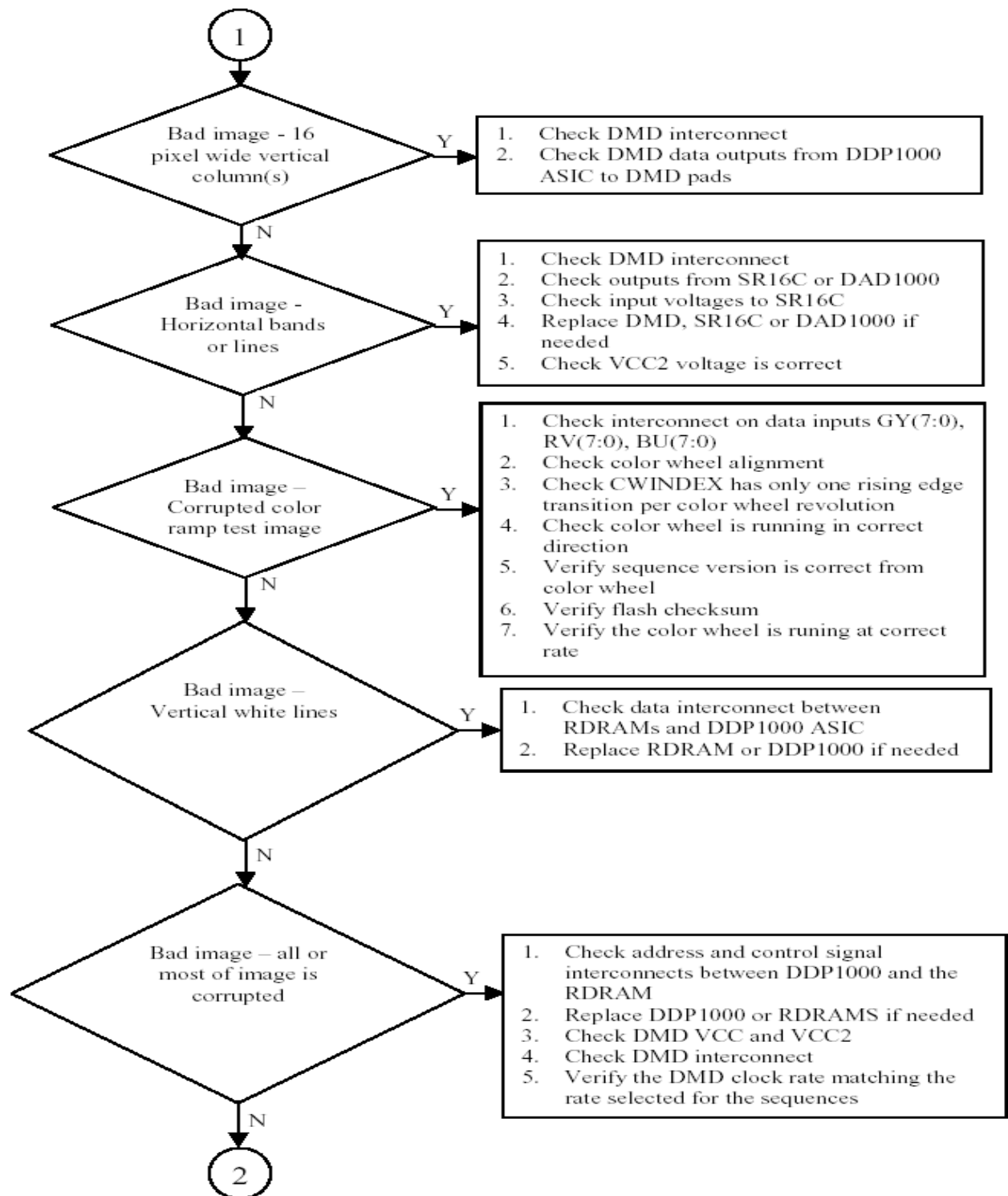
DX850 DC-DC BOARD

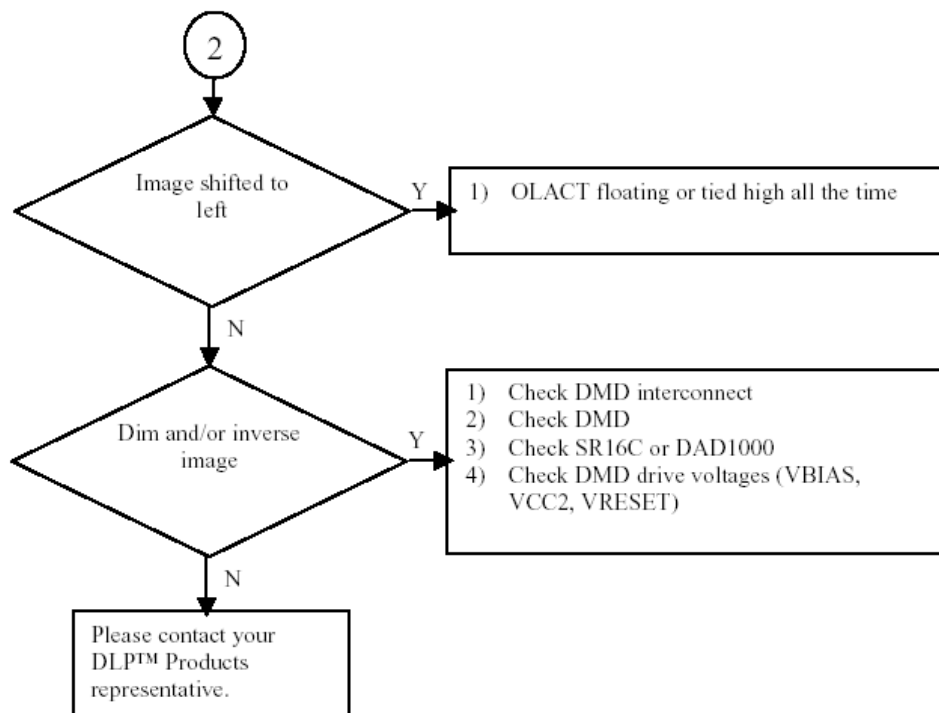


5. DMD Block Trouble Shooting Guide

DDP1000 Electronics Debugging Flow Diagram







Chapter 6 Firmware upgrade

Step 1.

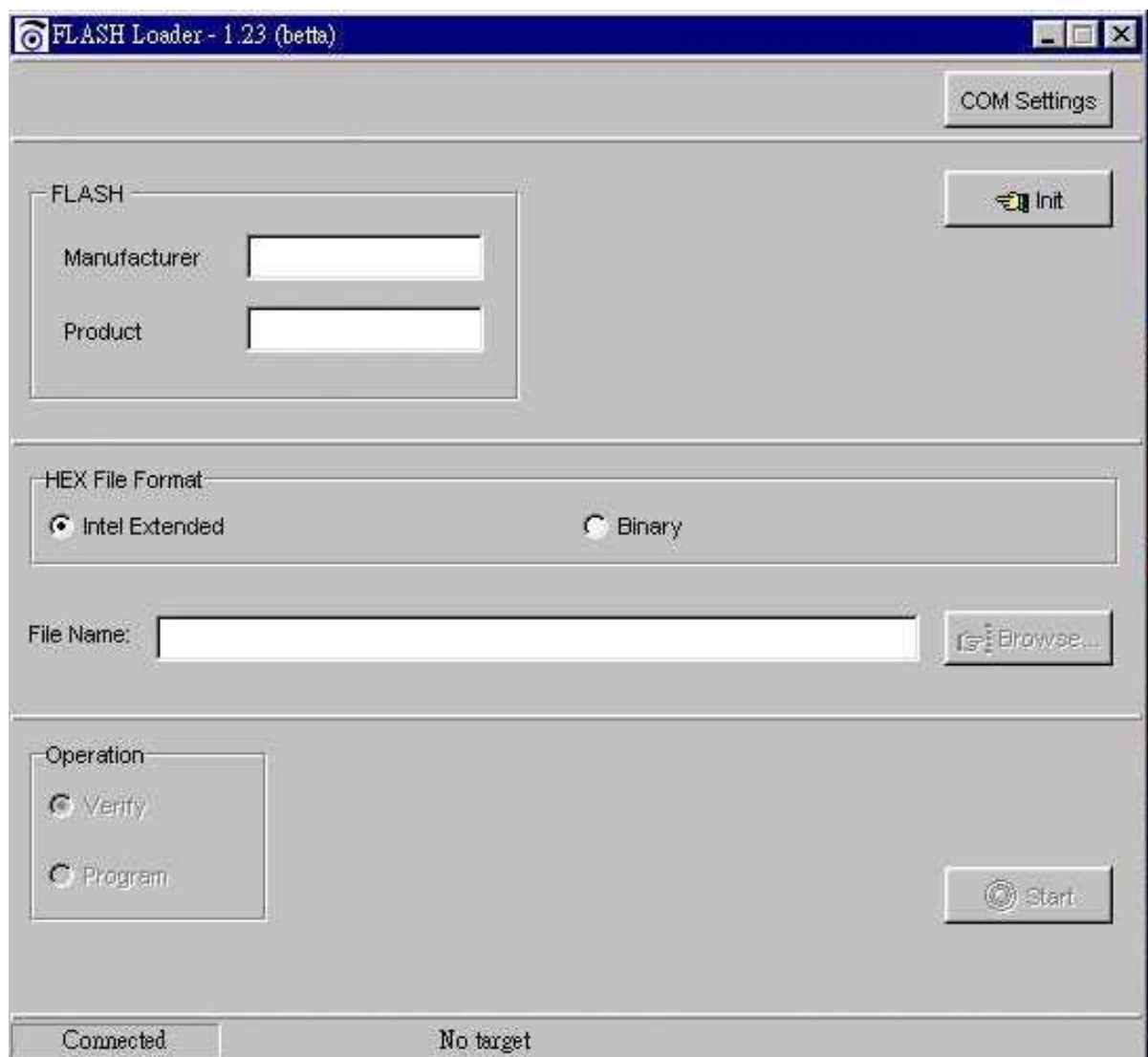
Setup Flashloader in computer.

Step 2.

- a. Connect download cable with computer and projector
- b. Connect power cord with projector and check Power switch is OFF.

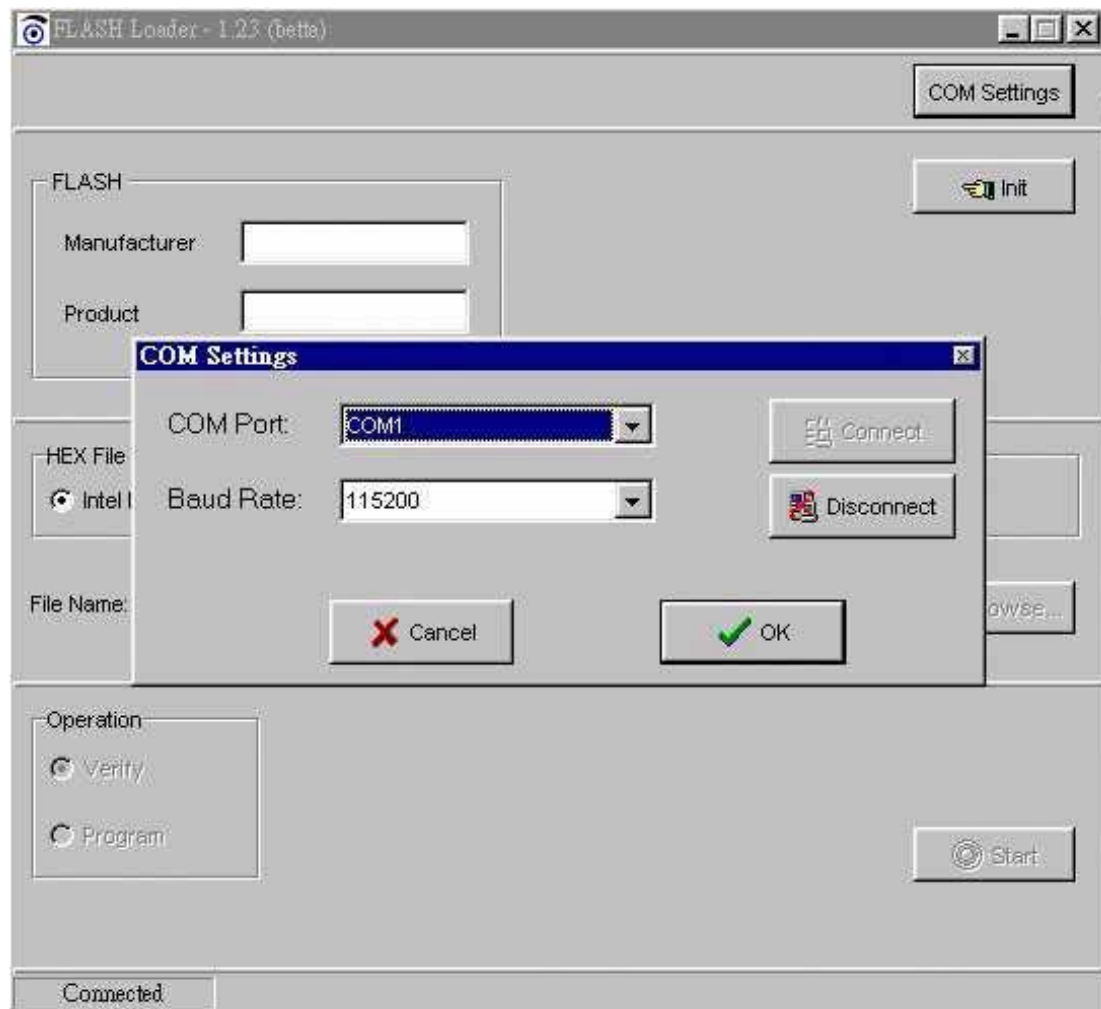
Step 3.

Execute FLASH loader.exe



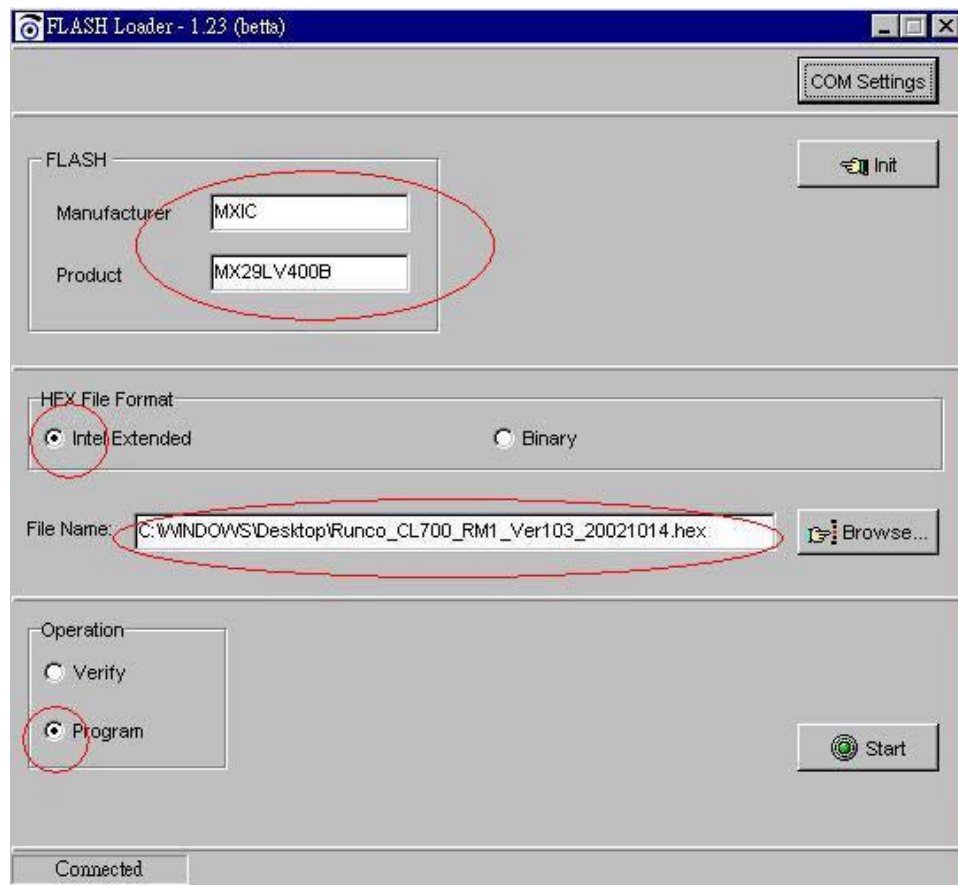
Step 4.

Setting COM Port & Baud Rate



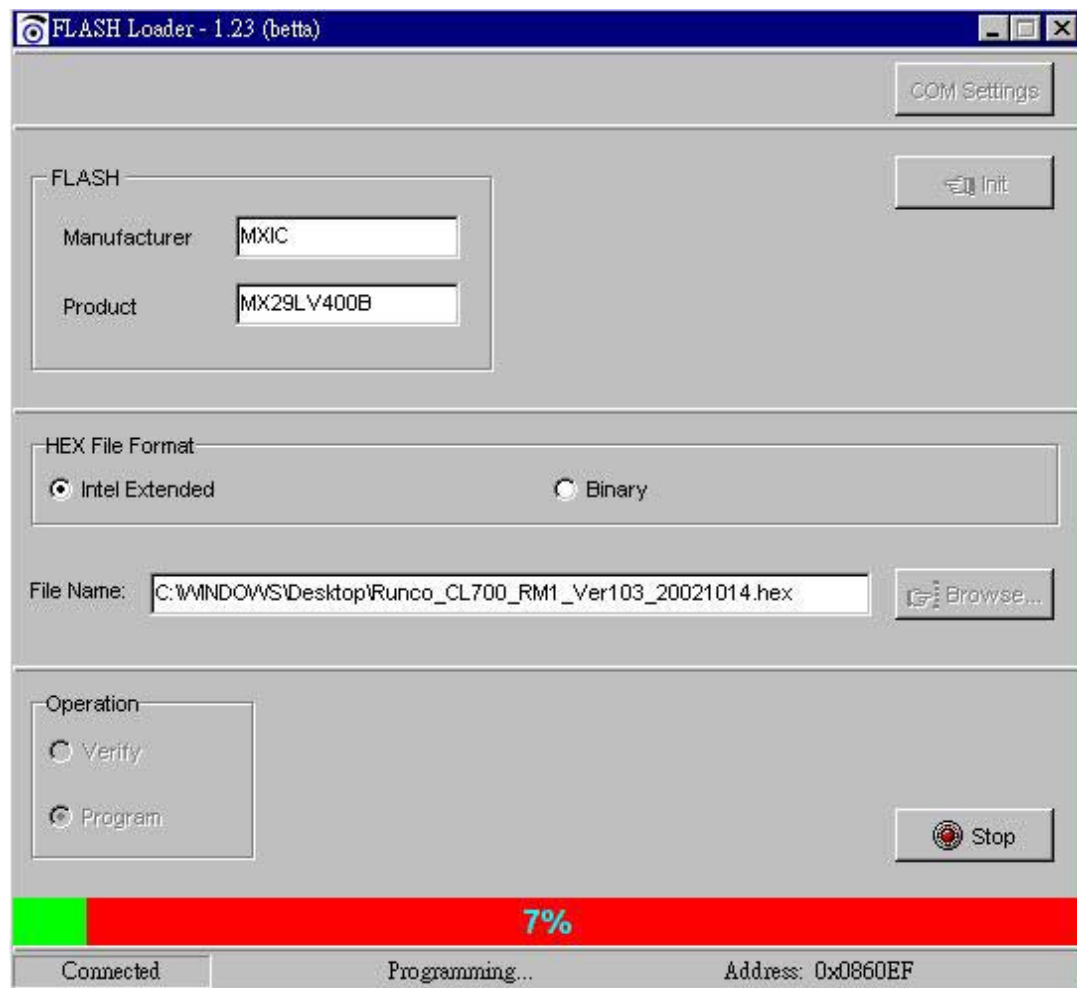
Step 5.

- a. Turn on the power switch of the projector, then the Program will target the Flash.
- b. HEX File Format choose **Intel Extended**
- c. File Name choose
- d. Operation choose **Program**



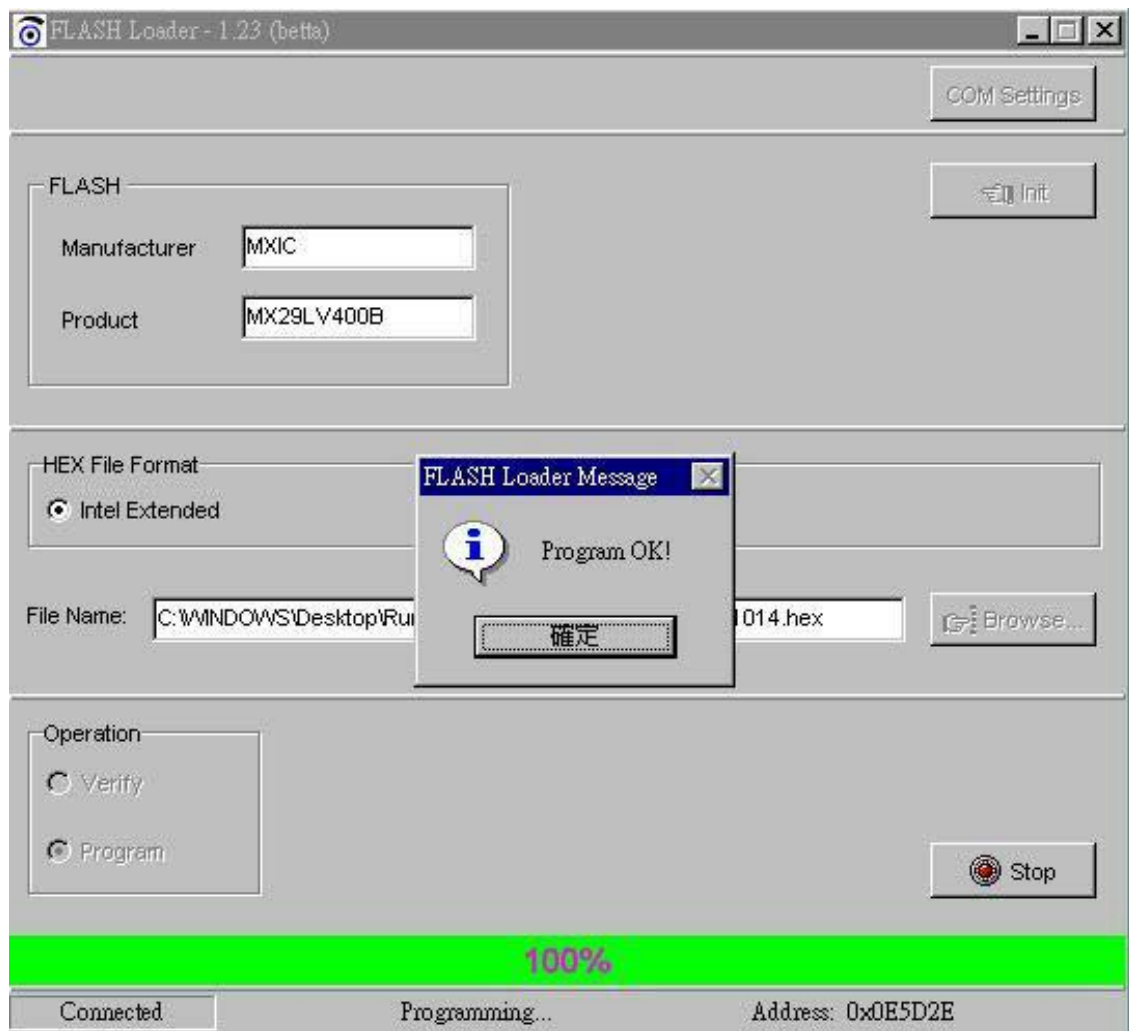
Step 6.

Start download firmware



Step 7.

Download finished.



Step 8.

Turn off the power switch.

Chapter 7 Factory OSD

Special Key for TOSHIBA DLP Projector TDP-D1

Rev. F 2003.1.25

The following keys are effective when inserting a power cord plug in a power socket. Press keys until the LED becomes standby mode.

Key1	Key2	Key3	Function
ON/STANDBY	INPUT	MENU	Reset the user lamp time *1
AUTO SET	AUTO KEYSTONE	MENU	Go to the special (factory) mode
INPUT	AUTO KEYSTONE	MENU	Ignore the error detection
ON/STANDBY	AUTO SET	MENU	Reserved

The following keys are effective while displaying the volume menu.

Key1	Key2	Key3	Function
AUTO SET	AUTO KEYSTONE	MENU	Go to the special (factory) mode

The following keys are effective in the special (factory) mode.

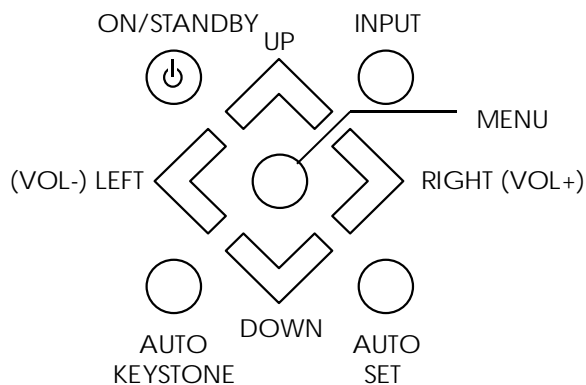
Key1	Key2	Key3	Function
AUTO KEYSTONE	UP	-	Display the lamp time menu
AUTO KEYSTONE	DOWN	-	Display the ADC level alignment menu *2
AUTO KEYSTONE	LEFT (VOL-)	-	Display the keystone calibration menu
AUTO KEYSTONE	RIGHT (VOL+)	-	Display the color wheel delay menu
INPUT	UP	-	Display the fan control menu
INPUT	DOWN	-	Display the white peak menu
INPUT	LEFT (VOL-)	-	Display the test pattern menu
INPUT	RIGHT (VOL+)	-	Display the video curtain & spoke light menu
ON/STANDBY	UP	-	Display the burn in mode menu
ON/STANDBY	DOWN	-	Display the RGB gain (DDP1000) menu
ON/STANDBY	LEFT (VOL-)	-	Reserved
ON/STANDBY	RIGHT (VOL+)	-	Save the factory data, the lamp data and the error data

The following keys are effective when inserting a power cord plug in a power socket. Press keys until the FlashUpgrader indicator begins to move.

Key1	Key2	FlashUpgrader	Function
AUTO SET	AUTO KEYSTONE	Waiting characters	Start firmware upgrade

*1 This operation method is opened to a user in the manual.

*2 This menu is displayed only when a screen size is FULL mode and an input source is RGB/YPbPr.



Chapter 8 Alignment Procedure

1. Optical Engine assembly procedures

Basically the assembly of optical engine is exactly the same as SL700X series engines with following differences:

A. Projector Lens assembly

After finishing the assembly of DMD Housing, assembly the projection lens THAN assembly the Zoom Ring than Focus Ring.

2. Optical Alignment

A. Light pipe adjustment procedure

i. Equipment:

PC or Pattern Generator (Chroma 2250)

Screw Driver for M2

ii. Procedures:

Project “Full white” pattern (from PC, or Chroma2250 pattern 41, or enter spoken light mode) on screen.

Adjust the two light pips adjusting screws until “Dark Edge” disappear on all edges of screen. Sequence of adjust is: Left-Right screw first, then Up-Down screw.

Apply glue on screws to fix the screw position.

Apply silicon glue between “Clip” and Light Pipe.

3. Electronic Alignment Procedures

A. DMD Bias Voltage Alignment

Equipment:

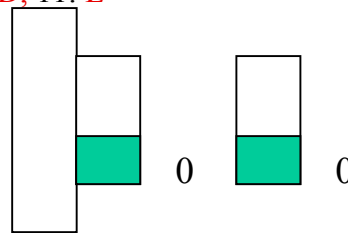
None

Procedure:

Watch DMD chip Label (Example: 9477000 0234**B**)

Switch the DIP switch on Chip board according to the character on the DMD chip

00: **B**, 01: **C**, 10: **D**, 11: **E**



B Color Wheel Delay Alignment

Equipment:

Battery Biased Silicon PIN Detector

Oscilloscope

Probe

The default values let optical engine to get maximum contrast and brightness.

Procedure:

Open Factory OSD, and select color wheel delay item

Leave the image pure red

Put the detector on the screen that red image was projected.

Watch the oscilloscope and notice the square waveform

Use the “→” and “←” key to increment or decrement the color wheel delay alue

Do not adjust too much, let the signal get ahead, if it happens, go back to step 5 and do it again.

Change the input to pure blue and repeat the above procedures again.

Change the input to pure green and repeat the above procedures again.

Power Off (otherwise the value will not saved)

C PC Offset/Gain Alignment Procedure

Equipment:

Pattern generator (Chroma 2250)

Procedure:

Check the input source PC

Change Timing and pattern of pattern generator:

Timing: 1024x768@60Hz (H: 48Khz, V: 60Hz)

Pattern: Full Black

Send the Auto Sub Brightness Command to projector

Command: STX A S B ETX

Check the brightness value after alignment

Change Timing and pattern of pattern generator:

Timing: 1024x768@60Hz (H: 48Khz, V: 60Hz)

Pattern: Full White

Send the Auto Sub Contrast Command to projector

Command: STX A S C ETX

Check the contrast value after alignment

Check the 32 levels of gray. All steps must appear

Send Save Factory & Lamp Data Command

Command: STX F S V ETX

D. YpbPr Offset Alignment Procedure

Equipment:

Pattern generator (VG828)

Procedure:

Check the input source YPbPr

Change Timing and pattern of pattern generator:

Timing: 480P

Pattern: Full Black

Disable the Red & Blue channel signals (Only Green channel available)

Send the Auto Sub Brightness Command to projector

Command: STX A S B ETX

Check the brightness value after alignment

Check the 32 levels of gray. All steps must appear

Send Save Factory & Lamp Data Command

Command: STX F S V ETX

E. Auto Keystone Alignment Procedure

Equipment:

Jig of ± 3 Procedure:

Set 0° angle of platform

Put the projector on it (already power on)

Send the Keystone Calibration 0 Command to projector

Command: STX K C 0 ETX

Check the keystone calibration 0 value after alignment

0° angle platform

Set $+30^\circ$ angle of platform

Send the Keystone Calibration 1 Command to projector

Command: STX K C 1 ETX

Check the keystone calibration 1 value after alignment

Set -30° angle of platform

Send the Keystone Calibration 2 Command to projector

Command: STX K C 2 ETX

Check the keystone calibration 2 value after alignment

After 5 ~ 10 minutes power on

Set 0° angle of platform

Send the Keystone Calibration 3 Command to projector

Command: STX K C 3 ETX

Check the keystone calibration 3 value after alignment

Send Save Factory & Lamp Data Command

Command: STX F S V ETX

F. PC and Component signal test

Equipment:

Pattern generator (Chroma 2250)

Pattern generator (VG828)

Procedure:

Change the input signal to source PC

Change the bellowing Timing and pattern of pattern generator:

Timing: 640x480@60Hz

00x600@60Hz

24x768@60Hz

1280x1024@60Hz

1600x1200@60Hz

Pattern: SMPTE RP-133

To check each above timing phase, H and V position, frequency is correct or not.

Change the input signal to input YpbPr

Timing: 1125i

Pattern: Color Bar

Check the signal formation, color and image quality.

G. Menu Reset before output

Equipment:

N/A

Procedure:

The reset menu is shown by pressing the [MENU/ENTER] button during two seconds. Select item by [UP] or [DOWN] button.

	Computer	Y/PB/PR	Video	S-video
Horizontal reference value reset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reset all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

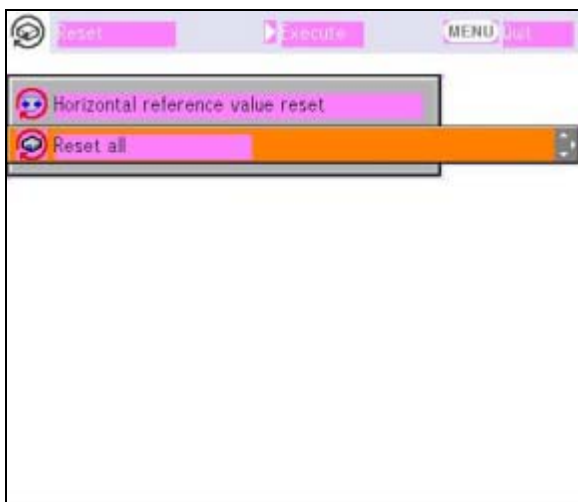


Fig. 8-1 Reset all setting value of the user menu

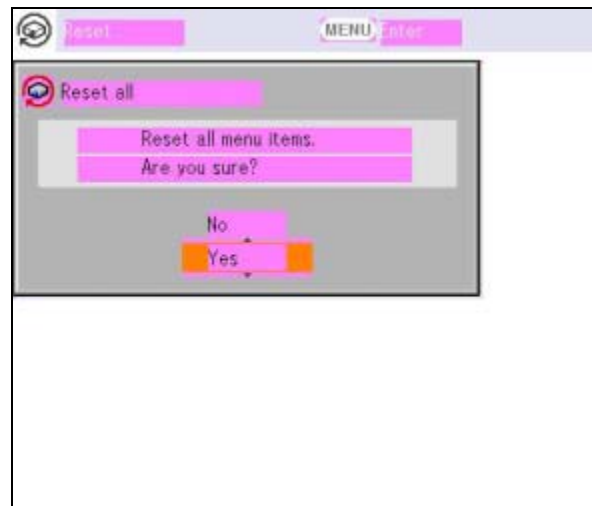


Fig. 8-2 Execute menu of reset all

Chapter 9 Signal table

Supported Signals for TOSHIBA DLP Projector TDP-D1

Rev. C 2003.1.28

Format	Active Video		Frequency			H Timing (Pixels)				V Timing (Lines)				Sync		Firmware Definition		
	H Pixels	V Lines	V Freq.	H Freq.	Pixel Clock	Total	F Porch	Sync	B Porch	Total	F Porch	Sync	B Porch	H	V	No.	Mode Name	OSD Name
Computer Source																		
VESA 640 x 480 @ 60Hz	640	480	59.940	31.469	25.175	800	16	96	48	525	10	2	33	N	N	3	sm640X480_60 *1	VGA_60 *1
VGA Text 480 Lines @ 60Hz	640	480	59.940	31.469	25.175	800	16	96	48	525	10	2	33	N	N	3	sm640X480_60 *1	VGA_60 *1
VGA Text 480 Lines @ 60Hz	720	480	59.941	31.469	28.322	900	18	108	54	525	10	2	33	N	N	3	sm640X480_60 *1	VGA_60 *1
VESA 640 x 480 @ 72Hz	640	480	72.809	37.861	31.500	832	24	40	128	520	9	3	28	N	N	4	sm640X480_72	VGA_72
VESA 640 x 480 @ 75Hz	640	480	75.000	37.500	31.500	840	16	64	120	500	1	3	16	N	N	5	sm640X480_75	VGA_75
VESA 640 x 480 @ 85Hz	640	480	85.008	43.269	36.000	832	56	56	80	509	1	3	25	N	N	6	sm640X480_85	VGA_85
640 x 480 @ 70Hz	640	480	69.444	34.722	28.229	813	29	96	48	500	3	2	15	P	P	7	sm640X480_70	640 X 480_70
640 x 480 @ 90Hz	640	480	90.038	45.829	38.130	832	56	56	80	509	6	3	20	P	P	8	sm640X480_90A	640 X 480_90 A
DELL 640 x 480 @ 90Hz	640	480	89.898	47.916	39.866	832	56	56	80	533	2	3	48	P	P	9	sm640X480_90B	640 X 480_90 B
DELL 640 x 480 @ 100Hz	640	480	99.989	52.994	44.939	848	32	96	80	530	1	3	46	P	P	10	sm640X480_100	640 X 480_100
DELL 640 x 480 @ 120Hz	640	480	120.254	63.735	55.067	864	48	96	80	530	1	3	46	P	P	11	sm640X480_120	640 X 480_120
Macintosh 13 Inch Mode @ 67Hz	640	480	66.667	35.000	30.240	864	64	64	96	525	3	3	39	N	N	12	sm640X480_67	640 X 480_67
NEC PC98 Standard @ 56Hz	640	400	56.420	24.825	21.051	848	59	64	85	440	0	8	32	N	N	13	sm640X400_56	640 X 400_56
VGA Text 400 Lines @ 60Hz	640	400	59.940	31.469	25.175	800	16	96	48	525	50	2	73	N	N	14	sm720X400_60 *1	720 X 400_60 *1
VGA Text 400 Lines @ 60Hz	720	400	59.941	31.469	28.322	900	18	108	54	525	50	2	73	N	N	14	sm720X400_60 *1	720 X 400_60 *1
iMac 800x600@95Hz	800	600	94.890	59.970	62.369	1040	18	82	140	632	1	3	28	P	P	15	sm800X600_95	800 X 600_95
ASUS 640x480@150Hz	640	480	150.233	78.722	68.016	864	42	72	110	524	1	3	40	P	P	16	sm640X480_150	640 X 480_150
VGA Graphic 350 Lines @ 70Hz	640	350	70.090	31.470	25.176	800	14	96	50	449	38	2	59	P	N	17	sm720X400_70 *1	720 X 400_70 *1
VGA Graphic 400 Lines @ 70Hz	640	400	70.090	31.470	25.176	800	14	96	50	449	13	2	34	N	P	17	sm720X400_70 *1	720 X 400_70 *1
VGA Text 350 Lines @ 70Hz	720	350	70.090	31.470	28.323	900	18	108	54	449	38	2	59	P	N	17	sm720X400_70 *1	720 X 400_70 *1
VGA Text 400 Lines @ 70Hz	720	400	70.090	31.470	28.323	900	18	108	54	449	13	2	34	N	P	17	sm720X400_70 *1	720 X 400_70 *1
ASUS 800x600@144Hz	800	600	143.961	94.007	102.279	1088	58	88	142	653	1	3	49	P	P	18	sm800X600_144	800 X 600_144
VESA 640 x 350 @ 85Hz	640	350	85.080	37.861	31.500	832	32	64	96	445	32	3	60	P	N	19	sm720X400_85 *1	720 X 400_85 *1
VESA 640 x 400 @ 85Hz	640	400	85.080	37.861	31.500	832	32	64	96	445	1	3	41	N	P	19	sm720X400_85 *1	720 X 400_85 *1
VESA 720 x 400 @ 85Hz	720	400	85.039	37.927	35.500	936	36	72	108	446	1	3	42	N	P	19	sm720X400_85 *1	720 X 400_85 *1
Wide VGA @ 60Hz	852	480	59.973	31.726	34.010	1072	58	108	54	529	14	2	33	N	N	20	sm852X480_60	852 X 480_60
VESA 800 x 600 @ 56Hz	800	600	56.250	35.156	36.000	1024	24	72	128	625	1	2	22	P	P	21	sm800X600_56	SVGA_56
VESA 800 x 600 @ 60Hz	800	600	60.317	37.879	40.000	1056	40	128	88	628	1	4	23	P	P	22	sm800X600_60	SVGA_60
VESA 800 x 600 @ 72Hz	800	600	72.188	48.077	50.000	1040	56	120	64	666	37	6	23	P	P	23	sm800X600_72	SVGA_72
VESA 800 x 600 @ 75Hz	800	600	75.000	46.875	49.500	1056	16	80	160	625	1	3	21	P	P	24	sm800X600_75	SVGA_75
VESA 800 x 600 @ 85Hz	800	600	85.061	53.673	56.250	1048	32	64	152	631	1	3	27	P	P	25	sm800X600_85	SVGA_85
800 x 600 @ 80Hz	800	600	80.011	50.327	53.145	1056	16	80	160	629	1	3	25	P	P	26	sm800X600_80	800 X 600_80
800 x 600 @ 90Hz	800	600	90.045	56.818	59.546	1048	32	64	152	631	1	3	27	P	P	27	sm800X600_90	800 X 600_90
800 x 600 @ 100Hz	800	600	100.021	63.613	68.194	1072	56	64	152	636	6	3	27	P	P	28	sm800X600_100A	800 X 600_100 A
800 x 600 @ 110Hz	800	600	110.035	70.422	75.493	1072	56	64	152	640	10	3	27	P	P	29	sm800X600_110	800 X 600_110
800 x 600 @ 120Hz	800	600	120.372	77.399	84.210	1088	72	64	152	643	13	3	27	P	P	30	sm800X600_120A	800 X 600_120 A
DELL 800 x 600 @ 48Hz I	800	300	96.114	33.784	35.946	1064	48	64	152	351.5	4.5	3	44	P	P	31	sm800X600_48	800 X 600_48
DELL 800 x 600 @ 70Hz	800	600	70.099	44.583	44.940	1008	24	96	88	636	4	4	28	P	P	32	sm800X600_70	800 X 600_70
DELL 800 x 600 @ 100Hz	800	600	100.189	64.021	67.606	1056	40	64	152	639	9	3	27	P	P	33	sm800X600_100B	800 X 600_100 B
DELL 800 x 600 @ 120Hz	800	600	120.031	76.220	81.098	1064	48	64	152	635	5	3	27	P	P	34	sm800X600_120B	800 X 600_120 B

Supported Signals for TOSHIBA DLP Projector TDP-D1

Rev. C 2003.1.28

Format	Active Video		Frequency			H Timing (Pixels)				V Timing (Lines)				Sync		Firmware Definition		
	H Pixels	V Lines	V Freq.	H Freq.	Pixel Clock	Total	F Porch	Sync	B Porch	Total	F Porch	Sync	B Porch	H	V	No.	Mode Name	OSD Name
DELL 800 x 600 @ 160Hz	800	600	160.278	101.937	110.092	1080	64	64	152	636	6	3	27	P	P	35	sm800X600_160	800 X 600_160
DELL 800 x 600 @ 200Hz	800	600	199.160	125.471	134.505	1072	56	64	152	630	1	3	26	P	P	36	sm800X600_200	800 X 600_200
Macintosh 16 Inch Mode @ 75Hz	832	624	74.550	49.725	57.283	1152	26	64	230	667	3	3	37	N	N	37	sm832X624_75	MAC16"
960 x 720 @ 60Hz	960	720	60.004	44.763	55.864	1248	40	108	140	746	3	3	20	P	P	38	sm960X720_60	960 X 720_60
960 x 720 @ 75Hz	960	720	75.013	55.960	69.838	1248	40	108	140	746	3	3	20	P	P	39	sm960X720_75	960 X 720_75
960 x 720 @ 85Hz	960	720	85.002	63.411	79.138	1248	40	108	140	746	3	3	20	P	P	40	sm960X720_85	960 X 720_85
VESA 1024 x 768 @ 43Hz	1024	384	86.958	35.522	44.900	1264	8	176	56	408.5	0	4	20.5	P	P	41	sm1024X768_43	XGA_43I
VESA 1024 x 768 @ 60Hz	1024	768	60.004	48.363	65.000	1344	24	136	160	806	3	6	29	N	N	42	sm1024X768_60	XGA_60
VESA 1024 x 768 @ 70Hz	1024	768	70.069	56.476	75.000	1328	24	136	144	806	3	6	29	N	N	43	sm1024X768_70	XGA_70
VESA 1024 x 768 @ 75Hz	1024	768	75.029	60.023	78.750	1312	16	96	176	800	1	3	28	P	P	44	sm1024X768_75A	XGA_75
VESA 1024 x 768 @ 85Hz	1024	768	84.997	68.678	94.500	1376	48	96	208	808	1	3	36	P	P	45	sm1024X768_85	XGA_85
Macintosh 19 Inch Mode @ 75Hz	1024	768	74.700	60.134	79.857	1328	36	96	172	805	4	3	30	N	N	46	sm1024X768_75B	MAC19"
1024 x 768 @ 90Hz	1024	768	90.029	72.833	100.219	1376	48	96	208	809	2	3	36	P	P	47	sm1024X768_90	1024 X 768_90
1024 x 768 @ 110Hz A	1024	768	109.901	90.009	125.292	1392	64	96	208	819	2	3	46	P	P	48	sm1024X768_110A	1024 X 768_110 A
1024 x 768 @ 110Hz B	1024	768	112.294	91.407	127.239	1392	64	96	208	814	1	3	42	P	P	49	sm1024X768_110B	1024 X 768_110 B
DELL 1024 x 768 @ 100Hz	1024	768	99.771	80.515	110.145	1368	40	96	208	807	1	3	35	P	P	50	sm1024X768_100	1024 X 768_100
DELL 1024 x 768 @ 120Hz	1024	768	119.841	96.712	129.981	1344	16	96	208	807	1	3	35	P	P	51	sm1024X768_120	1024 X 768_120
DELL 1024 x 768 @ 140Hz	1024	768	139.988	113.250	157.644	1392	64	96	208	809	1	3	37	P	P	52	sm1024X768_140	1024 X 768_140
SUN 1024 x 800 @ 85Hz	1024	800	84.011	70.821	97.450	1376	48	96	208	843	4	3	36	P	P	53	sm1024X800_85	1024 X 800_85
NEC 1120 x 750 @ 40Hz I	1120	375	80.054	32.862	47.847	1456	38	112	186	410.5	0.5	3	32	N	N	54	sm1120X750_40	1120 X 750_40
CPQ 1152 x 864 @ 43Hz	1152	864	43.600	45.998	66.513	1446	48	116	130	1055	70	3	118	P	P	55	sm1152X864_43	1152 X 864_43
DMT 1152 x 864 @ 60Hz	1152	864	60.039	53.735	79.528	1480	52	128	148	895	1	3	27	P	P	56	sm1152X864_60	1152 X 864_60
1152 x 864 @ 70Hz	1152	864	70.019	63.857	94.509	1480	22	128	178	912	2	4	42	P	P	57	sm1152X864_70	1152 X 864_70
VESA 1152 x 864 @ 75Hz	1152	864	75.000	67.500	108.000	1600	64	128	256	900	1	3	32	P	P	58	sm1152X864_75	SXGA1_75
DMT 1152 x 864 @ 85Hz	1152	864	85.007	77.101	121.512	1576	40	128	256	907	8	3	32	P	P	59	sm1152X864_85	1152 X 864_85
1152 x 864 @ 100Hz	1152	864	100.688	91.324	143.927	1576	40	128	256	907	8	3	32	P	P	60	sm1152X864_100	1152 X 864_100
Macintosh 21 Inch Mode @ 75Hz	1152	870	75.062	68.682	100.001	1456	28	128	148	915	3	3	39	N	N	61	sm1152X870_75	1152 X 870_75
SUN 1152 x 900 @ 66Hz	1152	900	66.004	61.846	94.500	1528	40	128	208	937	0	4	33	C	C	62	sm1152X900_66	1152 X 900_66
SUN 1152 x 900 @ 76Hz	1152	900	76.637	71.809	108.001	1504	32	128	192	937	2	4	31	C	C	63	sm1152X900_76	1152 X 900_76
1280 x 720 @ 70Hz	1280	720	69.472	52.521	88.970	1694	48	112	254	756	1	3	32	P	P	64	sm1280X720_70	1280 X 720_70
1280 x 720 @ 72Hz	1280	720	71.577	54.112	91.666	1694	22	144	248	756	1	3	32	P	P	65	sm1280X720_72	1280 X 720_72
1280 x 720 @ 75Hz	1280	720	74.605	56.401	95.544	1694	22	144	248	756	1	3	32	P	P	66	sm1280X720_75	1280 X 720_75
1280 x 720 @ 85Hz	1280	720	85.064	64.308	109.967	1710	38	144	248	756	1	3	32	P	P	67	sm1280X720_85	1280 X 720_85
1280 x 720 @ 100Hz	1280	720	100.047	76.336	131.908	1728	56	144	248	763	8	3	32	P	P	68	sm1280X720_100	1280 X 720_100
1280 x 720 @ 120Hz	1280	720	120.050	92.799	161.841	1744	248	64	152	773	24	3	26	P	P	69	sm1280X720_120	1280 X 720_120
1280 x 720 @ 140Hz	1280	720	140.089	109.410	192.342	1758	78	144	256	781	2	3	56	P	P	70	sm1280X720_140	1280 X 720_140
1600 x 900 @ 60Hz	1600	900	60.043	55.960	119.978	2144	94	180	270	932	1	3	28	N	P	71	sm1600X900_60	1600 X 900_60
1600 x 900 @ 70Hz	1600	900	69.980	65.501	140.435	2144	108	168	268	936	1	3	32	N	P	72	sm1600X900_70	1600 X 900_70
1600 x 900 @ 72Hz	1600	900	71.990	67.527	144.777	2144	108	168	268	938	1	3	34	N	P	73	sm1600X900_72	1600 X 900_72
1600 x 900 @ 75Hz	1600	900	75.230	70.716	151.616	2144	96	168	280	940	1	3	36	N	P	74	sm1600X900_75	1600 X 900_75
1600 x 900 @ 85Hz	1600	900	85.250	80.561	172.723	2144	96	168	280	945	1	3	41	P	P	75	sm1600X900_85	1600 X 900_85

Supported Signals for TOSHIBA DLP Projector TDP-D1

Rev. C 2003.1.28

Format	Active Video		Frequency			H Timing (Pixels)				V Timing (Lines)				Sync		Firmware Definition		
	H Pixels	V Lines	V Freq.	H Freq.	Pixel Clock	Total	F Porch	Sync	B Porch	Total	F Porch	Sync	B Porch	H	V	No.	Mode Name	OSD Name
1600 x 900 @ 100Hz	1600	900	100.530	95.805	205.406	2144	96	168	280	953	1	3	49	P	P	76	sm1600X900_100	1600 X 900_100
VESA 1280 x 960 @ 60Hz	1280	960	60.000	60.000	108.000	1800	96	112	312	1000	1	3	36	P	P	77	sm1280X960_60	QUAD VGA_60
1280 x 960 @ 75Hz	1280	960	75.019	75.019	126.032	1680	40	112	248	1000	1	3	36	P	P	78	sm1280X960_75	1280 X 960_75
VESA 1280 x 960 @ 85Hz	1280	960	85.002	85.937	148.500	1728	64	160	224	1011	1	3	47	P	P	79	sm1280X960_85	QUAD VGA_85
1280 x 1024 @ 43Hz	1280	512	86.872	49.908	79.853	1600	80	80	160	574.5	24	5	33.5	P	P	80	sm1280X1024_43	1280 X 1024_43l
VESA 1280 x 1024 @ 60Hz	1280	1024	60.020	63.981	108.000	1688	48	112	248	1066	1	3	38	P	P	81	sm1280X1024_60	SXGA3_60
1280 x 1024 @ 72Hz	1280	1024	72.037	76.863	132.820	1728	48	112	288	1067	2	3	38	P	P	82	sm1280X1024_72	1280 X 1024_72
VESA 1280 x 1024 @ 75Hz	1280	1024	75.025	79.976	135.000	1688	16	144	248	1066	1	3	38	P	P	83	sm1280X1024_75	SXGA3_75
1280 x 1024 @ 80Hz	1280	1024	80.003	85.763	149.571	1744	72	144	248	1072	1	3	44	P	P	84	sm1280X1024_80	1280 X 1024_80
VESA 1280 x 1024 @ 85Hz	1280	1024	85.024	91.146	157.500	1728	64	160	224	1072	1	3	44	P	P	85	sm1280X1024_85	SXGA3_85
1280 x 1024 @ 90Hz	1280	1024	90.063	97.088	169.321	1744	80	160	224	1078	3	3	48	P	P	86	sm1280X1024_90	1280 X 1024_90
1280 x 1024 @ 100Hz	1280	1024	100.072	108.578	191.097	1760	44	180	256	1085	10	3	48	P	P	87	sm1280X1024_100	1280 X 1024_100
1600 x 1024 @ 60Hz	1600	1024	60.012	63.613	136.386	2144	48	192	304	1060	5	3	28	P	P	88	sm1600X1024_60	1600 X 1024_60
1600 x 1024 @ 70Hz	1600	1024	70.350	74.571	159.880	2144	48	192	304	1060	1	3	32	P	P	89	sm1600X1024_70	1600 X 1024_70
1600 x 1024 @ 72Hz	1600	1024	72.513	76.864	164.796	2144	48	192	304	1060	1	3	32	P	P	90	sm1600X1024_72	1600 X 1024_72
1600 x 1024 @ 75Hz	1600	1024	75.051	79.554	170.564	2144	48	192	304	1060	1	3	32	P	P	91	sm1600X1024_75	1600 X 1024_75
1600 x 1024 @ 85Hz	1600	1024	85.067	90.171	193.327	2144	48	192	304	1060	1	3	32	P	P	92	sm1600X1024_85	1600 X 1024_85
DELL 1400 x 1050 @ 60Hz	1400	1050	60.060	64.024	108.457	1694	30	128	136	1066	1	3	12	P	P	93	sm1400X1050_60	SXGA+
1920 x 1080 @ 75Hz	1920	1080	74.640	84.194	218.904	2600	130	210	340	1128	1	3	44	N	P	94	sm1920X1080_75	1920 X 1080_75
1920 x 1080 @ 85Hz	1920	1080	85.040	96.435	193.642	2008	8	44	36	1134	7	3	44	P	P	95	sm1920X1080_85	1920 X 1080_85
DELL 1600 x 1200 @ 52Hz	1600	1200	51.868	74.794	161.554	2160	64	192	304	1442	93	3	146	P	P	96	sm1600X1200_52	1600 X 1200_52
VESA 1600 x 1200 @ 60Hz	1600	1200	60.000	75.000	162.000	2160	64	192	304	1250	1	3	46	P	P	97	sm1600X1200_60	UXGA_60
VESA 1600 x 1200 @ 65Hz	1600	1200	65.000	81.250	175.500	2160	64	192	304	1250	1	3	46	P	P	98	sm1600X1200_65	UXGA_65
VESA 1600 x 1200 @ 70Hz	1600	1200	70.000	87.500	189.000	2160	64	192	304	1250	1	3	46	P	P	99	sm1600X1200_70	UXGA_70
VESA 1600 x 1200 @ 75Hz	1600	1200	75.000	93.750	202.500	2160	64	192	304	1250	1	3	46	P	P	100	sm1600X1200_75	UXGA_75
VESA 1600 x 1200 @ 85Hz	1600	1200	85.000	106.250	229.500	2160	64	192	304	1250	1	3	46	P	P	101	sm1600X1200_85	UXGA_85
1600 x 1200 @ 90Hz	1600	1200	89.989	112.486	242.970	2160	64	192	304	1250	1	3	46	P	P	102	sm1600X1200_90	1600 X 1200_90
1920 x 1200 @ 55Hz	1920	1200	54.959	66.226	139.868	2112	34	72	86	1205	1	2	2	P	P	103	sm1920X1200_55	1920 X 1200_55
1920 x 1200 @ 60Hz	1920	1200	60.040	74.570	193.881	2600	130	210	340	1242	1	3	38	N	P	104	sm1920X1200_60	1920 X 1200_60
1920 x 1200 @ 85Hz	1920	1200	85.244	107.066	215.204	2010	10	44	36	1256	9	3	44	P	P	105	sm1920X1200_85	1920 X 1200_85
VESA 1792 x 1344 @ 60Hz	1792	1344	60.000	83.640	204.751	2448	128	200	328	1394	1	3	46	P	P	106	sm1792X1344_60	1792 X 1344_60
VESA 1792 x 1344 @ 75Hz	1792	1344	74.997	106.271	261.001	2456	96	216	352	1417	1	3	69	P	P	107	sm1792X1344_75	1792 X 1344_75
VESA 1856 x 1392 @ 60Hz	1856	1392	59.995	86.333	218.249	2528	96	224	352	1439	1	3	43	P	P	108	sm1856X1392_60	1856 X 1392_60
VESA 1856 x 1392 @ 75Hz	1856	1392	75.000	112.500	288.000	2560	128	224	352	1500	1	3	104	P	P	109	sm1856X1392_75	1856 X 1392_75
VESA 1920 x 1440 @ 60Hz	1920	1440	60.000	90.000	234.000	2600	128	208	344	1500	1	3	56	P	P	110	sm1920X1440_60	1920 X 1440_60
VESA 1920 x 1440 @ 75Hz	1920	1440	75.000	112.500	297.000	2640	144	224	352	1500	1	3	56	P	P	111	sm1920X1440_75	1920 X 1440_75
2048 x 1536 @ 40Hz	2048	1536	40.009	61.614	138.015	2240	30	108	54	1540	1	2	1	P	P	112	sm2048X1536_40	2048 X 1536_40
2048 x 1536 @ 46Hz	2048	1536	46.021	70.872	158.754	2240	30	108	54	1540	1	2	1	P	P	113	sm2048X1536_46	2048 X 1536_46
eMac 1152x864@80Hz	1152	864	79.523	72.048	112.395	1560	66	128	214	906	1	3	38	P	P	114	sm1152X864_80	1152 X 864_80
2048 x 1536 @ 60Hz A *2	2048	1536	60.060	95.435	265.310	2780	132	220	380	1589	1	3	49	N	P	115	sm2048X1536_60B *1	2048 X 1536_60 *1
2048 x 1536 @ 60Hz B	2048	1536	59.978	95.785	201.723	2106	8	20	30	1597	12	3	46	P	P	115	sm2048X1536_60B *1	2048 X 1536_60 *1

Supported Signals for TOSHIBA DLP Projector TDP-D1


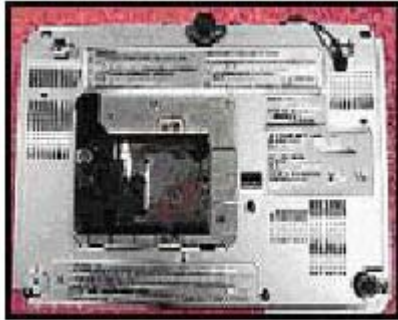





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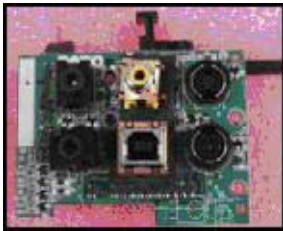








Format	Active Video		Frequency			H Timing (Pixels)				V Timing (Lines)				Sync		Firmware Definition		
	H Pixels	V Lines	V Freq.	H Freq.	Pixel Clock	Total	F Porch	Sync	B Porch	Total	F Porch	Sync	B Porch	H	V	No.	Mode Name	OSD Name
2048 x 1536 @ 60Hz C	2048	1536	59.981	95.970	238.772	2488	80	112	248	1600	15	3	46	P	P	115	sm2048X1536_60B *1	2048 X 1536_60 *1
eMac 1280x960@72Hz	1280	960	71.939	72.083	122.253	1696	44	102	270	1002	1	3	38	P	P	116	sm1280X960_72	1280 X 960_72
2048 x 1536 @ 75Hz	2048	1536	75.020	120.482	255.904	2124	4	48	24	1606	1	3	66	P	P	117	sm2048X1536_75	2048 X 1536_75
2048 x 1536 @ 80Hz	2048	1536	79.216	126.904	357.362	2816	96	224	448	1602	1	3	62	P	P	118	sm2048X1536_80	2048 X 1536_80
*1 These modes are used by two or more formats.																		
*2 This signal cannot be displayed on the whole screen.																		
Y/Pb/Pr Source																		
DTV525i@60Hz	720	242.5	59.940	15.734	13.500	858	16	63	59	262.5	3	6	11	C	C	130	sm525I	480I(525I)@60
DTV525p@60Hz	720	483	59.940	31.469	27.000	858	16	63	59	525	6	6	30	C	C	131	sm525P	480P(525P)@60
DTV625i@50Hz	720	288	50.000	15.625	13.500	864	12	63	69	312.5	1	3	20.5	C	C	132	sm625I	576I(625I)@50
DTV625p@50Hz	720	576	50.000	31.250	27.000	864	12	63	69	625	1	3	45	C	C	133	sm625P	576P(625P)@50
DTV750p@50Hz	1280	720	50.000	37.500	74.250	1980	400	80	220	750	5	5	20	C	C	134	sm750P_50	720P(750P)@50
DTV750p@60Hz	1280	720	60.000	45.000	74.250	1650	70	80	220	750	5	5	20	C	C	135	sm750P_60	720P(750P)@60
DTV1250i@50Hz E	1920	576	50.000	31.250	72.000	2304	64	128	192	625	5	3	41	C	C	136	sm1250I_50E	1152I(1250I)@50
DTV1125i@60Hz J	1920	517.5	60.000	33.750	74.250	2200	44	88	148	562.5	5	5	35	C	C	137	sm1125I_60J	1035I(1125I)@60
DTV1125i@50Hz	1920	540	50.000	28.125	74.250	2640	484	88	148	562.5	2.25	5	15.25	C	C	138	sm1125I_50	1080I(1125I)@50
DTV1125i@60Hz	1920	540	60.000	33.750	74.250	2200	44	88	148	562.5	2.25	5	15.25	C	C	139	sm1125I_60	1080I(1125I)@60
DTV1125p@50Hz	1920	1080	50.000	56.250	148.500	2640	484	88	148	1125	4	5	36	C	C	140	sm1125P_50	1080P(1125P)@50
DTV1125p@60Hz	1920	1080	60.000	67.500	148.500	2200	44	88	148	1125	4	5	36	C	C	141	sm1125P_60	1080P(1125P)@60
Video/S-Video Source																		
NTSC	720	240	59.940	15.734	13.500	858	-	-	-	262.5	-	-	-	C	C	150	smNTSC	NTSC
PAL	720	288	50.000	15.625	13.500	864	-	-	-	312.5	-	-	-	C	C	151	smPAL	PAL
SECAM	720	288	50.000	15.625	13.500	864	-	-	-	312.5	-	-	-	C	C	152	smSECAM	SECAM
PAL-M	720	240	59.940	15.734	13.500	858	-	-	-	262.5	-	-	-	C	C	153	smPALM	PAL-M
PAL-N	720	288	50.000	15.625	13.500	864	-	-	-	312.5	-	-	-	C	C	154	smPALN	PAL-N
PAL60	720	240	59.940	15.734	13.500	858	-	-	-	262.5	-	-	-	C	C	155	smPAL60	PAL60
NTSC4.43	720	240	59.940	15.734	13.500	858	-	-	-	262.5	-	-	-	C	C	156	smNTSC443	NTSC4.43
NTSC	720	240	59.940	15.734	13.500	858	-	-	-	262.5	-	-	-	C	C	157	smBW60	NTSC
PAL	720	288	50.000	15.625	13.500	864	-	-	-	312.5	-	-	-	C	C	158	smBW50	PAL
Internal Source																		
TOSHIBA Logo	1024	768	-	-	-	-	-	-	-	-	-	-	-	-	-	160	smSPLASH0	START UP
Dot/Cross	1024	768	-	-	-	-	-	-	-	-	-	-	-	-	-	161	smRAMP	START UP
32 Step	1024	768	-	-	-	-	-	-	-	-	-	-	-	-	-	162	smSTEP	START UP
4x4 Black/White	1024	768	-	-	-	-	-	-	-	-	-	-	-	-	-	163	smBW4X4	START UP
System (Not Source)																		
Mode Is Not Determined	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	smNOT_DETERMINED	***
No Signal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	smNOSIGNAL	NO SIGNAL

Format	Active Video		Frequency			H Timing (Pixels)				V Timing (Lines)				Sync		Firmware Definition		
	H Pixels	V Lines	V Freq.	H Freq.	Pixel Clock	Total	F Porch	Sync	B Porch	Total	F Porch	Sync	B Porch	H	V	No.	Mode Name	OSD Name
Unsupported Signal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	smUNSUPPORT	UNSUPPORT SIGNAL
Auto Detection	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	255	smAUTO	-

Chapter 10 Spare parts list





Toshiba Projector TDP-D1/D2 99.J5077.S15


NO.	TSB P/N	DESCRIPTION	Image
1	23436818	ASSY FOOT ADJUSTER	
2	23530967	ASSY BOTTOM COVER	
3	23530968	ASSY TOP COVER	
4	23530969	ASSY FRONT COVER (This is common for TDP-D1 and TDP-D2)	
4A	23587243	NAME PLATE, TDP-D1	Photo will be available soon
4B	23587244	NAME PLATE, TDP-D2	Photo will be available soon
5	23530970	ASSY LAMP COVER	
6	23530971	CONNECTOR COVER	
7	23587040	PC BOARD INTERFACE	

8	23587041	PC BOARD INPUT	
9	23587042	PC BOARD USB	
10	23587043	FAN MOTOR 50×20	 
11	23587044	OPTICAL ENGINE	
12	23587045	PC BOARD CHIP	
13	23587046	ASSY HOUSING DMD	
14	23587047	LENS	
15	23587048	ASSY DMD CONTACT HOUSING	

16	23587049	IC DMD CHIP	
17	23587050	ASSY COLOR WHEEL	
18	23587051	PC BOARD SENSOR	
19	23587052	COLOR WHEEL	
20	23587053	ASSY AC INLET/THERMAL SW/POWER SW	
21	23587054	PC BOARD KEYPAD	
22	23587055	ASSY SPEAKER+WIRE 100MM	
23	23587056	LAMP POWER EUC250	
24	23587057	ASSY REAR COVER+FANx2	

25	23587058 23587245	POWER MODULE EMI board is not included.	
26	23587059	PC BOARD FAN This board is included in Loc. 25 23587245	
26A	23587246	EMI BOARD	
27	23587061	OWNER'S MANUAL	
28	23587062	SHEET QUICK (JAP)	
29	23587063	OWNER'S MANUAL CD-ROM	
30	23587064	POWER CORD W/G	
31	23587065	CABLE RGB D-sub 15P	

32	23587066	CABLE RCA(Y/Y)	
33	23587067	CABLE RCA (AUDIO)	
34	23587068	CABLE BLK (AUDIO)	
35	23587069	CABLE USB	
36	23587074	SHEET QUICK (UK)	Reference to No.28
37	23587077	POWER CORD UK	
38	23587078	POWER CORD US/WO/SH	
39	23587079	POWER CORD CHINA	
40	23589070	REMOCON HAND UNIT	
41	23589071	BAG, SOFT CASE	

42	23589072	SHEET QUICK (US)	Reference to No.28
43	23589073	SHEET QUICK (EU)	Reference to No.28
44	23589075	SHEET QUICK (CH)	Reference to No.28
45	23589076	POWER CORD EUR	
46	23717119	LONG SCREW	
47	23747034	ASSY STAND OFF	
48	23890017	LENS CAP	
49	23918352	CARTON BOX	
50	23929988	ASSY TUNNEL	
51	23946538	PACKING FRONT	
52	23946539	PACKING REAR	

Chapter 11 RS232 Codes control procedure

RS232C Command List for TOSHIBA DLP Projector TDP-D1

Rev. K 2003.1.7

Command List

Function	In Standby	Use	Command Packet								Byte	Reply Packet				Byte	Same Function in Menu & Key
			Ascii	Char	Char	Char	Data1	Data2	Data3	Data4		Ascii	Ascii	Data 1	Data2		
Adjustment Group (RS232C Adjustment State)																	
Volume Up	-	User	STX	V	L	U	-	-	-	-	ETX	5	ACK	CR	0 - 31	3	Volume Menu
Volume Down	-	User	STX	V	L	D	-	-	-	-	ETX	5	ACK	CR	0 - 31	3	Volume Menu
Contrast	-	User	STX	V	C	N	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
Brightness	-	User	STX	V	B	R	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
Color	-	User	STX	V	C	L	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
Tint	-	User	STX	V	T	N	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
Sharpness	-	User	STX	V	S	H	-	-	-	-	ETX	5	ACK	CR	0 - 4	3	Image Adjustment Menu
R Level	-	User	STX	V	L	R	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
G Level	-	User	STX	V	L	G	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
B Level	-	User	STX	V	L	B	-	-	-	-	ETX	5	ACK	CR	0 - 32	3	Image Adjustment Menu
Up/Down Shift	-	User	STX	V	S	F	-	-	-	-	ETX	5	ACK	CR	0 - 16	3	Image Adjustment Menu
Phase	-	User	STX	P	P	H	-	-	-	-	ETX	5	ACK	CR	0 - 31	3	Auto Setting Menu RGB/YpPr
Frequency	-	User	STX	P	C	K	-	-	-	-	ETX	5	ACK	CR	0 - 128	3	Auto Setting Menu RGB
H Position	-	User	STX	P	H	P	-	-	-	-	ETX	5	ACK	CR	0 - 128	3	Auto Setting Menu RGB
V Position	-	User	STX	P	V	P	-	-	-	-	ETX	5	ACK	CR	0 - 64	3	Auto Setting Menu RGB
Keystone	-	User	STX	P	K	S	-	-	-	-	ETX	5	ACK	CR	0 - 90	3	Keystone Menu
White Peak	-	Factory	STX	W	H	P	-	-	-	-	ETX	5	ACK	CR	0 - 10	3	White Peak Menu
R Gain (DDP1000)	-	Factory	STX	D	G	R	-	-	-	-	ETX	5	ACK	CR	0 - 63	3	RGB Gain (DDP1000) Menu
G Gain (DDP1000)	-	Factory	STX	D	G	G	-	-	-	-	ETX	5	ACK	CR	0 - 63	3	RGB Gain (DDP1000) Menu
B Gain (DDP1000)	-	Factory	STX	D	G	B	-	-	-	-	ETX	5	ACK	CR	0 - 63	3	RGB Gain (DDP1000) Menu
Burn In Time Setting	-	Factory	STX	B	T	S	-	-	-	-	ETX	5	ACK	CR	0 - 48	3	Burn In Mode Menu
Burn In Time Setting (Direct)	-	Factory	STX	B	T	V	Byte Data	-	-	-	ETX	6	ACK	CR	0 - 48	3	Burn In Mode Menu
Adjustment Left	-	User / Factory	STX	A	L	F	-	-	-	-	ETX	5	ACK	CR	Byte Data	3	-
Adjustment Right	-	User / Factory	STX	A	R	G	-	-	-	-	ETX	5	ACK	CR	Byte Data	3	-
Color Wheel Delay	-	Factory	STX	C	W	D	-	-	-	-	ETX	5	ACK	CR	Word Data (MSB 1st)	4	Color Wheel Delay Menu
Color Wheel Delay (Large Step)	-	Factory	STX	C	W	L	-	-	-	-	ETX	5	ACK	CR	Word Data (MSB 1st)	4	Color Wheel Delay Menu
Color Wheel Delay (Direct)	-	Factory	STX	C	W	V	Word Data (MSB 1st)	-	-	-	ETX	7	ACK	CR	Word Data (MSB 1st)	4	Color Wheel Delay Menu
Adjustment Left (in CWD / CWL)	-	Factory	STX	A	L	F	-	-	-	-	ETX	5	ACK	CR	Word Data (MSB 1st)	4	-
Adjustment Right (in CWD / CWL)	-	Factory	STX	A	R	G	-	-	-	-	ETX	5	ACK	CR	Word Data (MSB 1st)	4	-
Setting Group (RS232C Setting State)																	
Screen Size Full	-	User	STX	M	S	F	-	-	-	-	ETX	5	ACK	CR	0	3	Display Setting Menu
Screen Size Through	-	User	STX	M	S	T	-	-	-	-	ETX	5	ACK	CR	1	3	Display Setting Menu
Screen Size Wide	-	User	STX	M	S	W	-	-	-	-	ETX	5	ACK	CR	2	3	Display Setting Menu
Language English	-	User	STX	L	E	N	-	-	-	-	ETX	5	ACK	CR	0	3	Display Setting Menu
Language French	-	User	STX	L	F	R	-	-	-	-	ETX	5	ACK	CR	1	3	Display Setting Menu
Language German	-	User	STX	L	G	R	-	-	-	-	ETX	5	ACK	CR	2	3	Display Setting Menu
Language Italian	-	User	STX	L	I	T	-	-	-	-	ETX	5	ACK	CR	3	3	Display Setting Menu
Language Spanish	-	User	STX	L	S	P	-	-	-	-	ETX	5	ACK	CR	4	3	Display Setting Menu
Language Portuguese	-	User	STX	L	P	O	-	-	-	-	ETX	5	ACK	CR	5	3	Display Setting Menu
Language Japanese	-	User	STX	L	J	P	-	-	-	-	ETX	5	ACK	CR	6	3	Display Setting Menu
Language Chinese S	-	User	STX	L	P	K	-	-	-	-	ETX	5	ACK	CR	7	3	Display Setting Menu
Language Chinese T	-	User	STX	L	K	T	-	-	-	-	ETX	5	ACK	CR	8	3	Display Setting Menu
Language Korean	-	User	STX	L	K	K	-	-	-	-	ETX	5	ACK	CR	9	3	Display Setting Menu
Background Logo	-	User	STX	B	G	0	-	-	-	-	ETX	5	ACK	CR	0	3	Display Setting Menu
Background Blue	-	User	STX	B	G	1	-	-	-	-	ETX	5	ACK	CR	1	3	Display Setting Menu
Background Black	-	User	STX	B	G	2	-	-	-	-	ETX	5	ACK	CR	2	3	Display Setting Menu
Icon On	-	User	STX	M	O	0	-	-	-	-	ETX	5	ACK	CR	1	3	Display Setting Menu
Icon Off	-	User	STX	M	O	1	-	-	-	-	ETX	5	ACK	CR	0	3	Display Setting Menu
Startup Screen On	-	User	STX	M	S	0	-	-	-	-	ETX	5	ACK	CR	1	3	Display Setting Menu
Startup Screen Off	-	User	STX	M	S	1	-	-	-	-	ETX	5	ACK	CR	0	3	Display Setting Menu
PJ Mode Standard	-	User	STX	P	J	0	-	-	-	-	ETX	5	ACK	CR	0	3	Default Setting Menu
PJ Mode Rear	-	User	STX	P	J	1	-	-	-	-	ETX	5	ACK	CR	1	3	Default Setting Menu
PJ Mode Ceiling	-	User	STX	P	J	2	-	-	-	-	ETX	5	ACK	CR	2	3	Default Setting Menu
PJ Mode Rear Ceiling	-	User	STX	P	J	3	-	-	-	-	ETX	5	ACK	CR	3	3	Default Setting Menu
No Signal Off Off	-	User	STX	P	N	0	-	-	-	-	ETX	5	ACK	CR	0	3	Default Setting Menu
No Signal Off 1 min.	-	User	STX	P	N	1	-	-	-	-	ETX	5	ACK	CR	1	3	Default Setting Menu
No Signal Off 2 min.	-	User	STX	P	N	2	-	-	-	-	ETX	5	ACK	CR	2	3	Default Setting Menu
No Signal Off 3 min.	-	User	STX	P	N	3	-	-	-	-	ETX	5	ACK	CR	3	3	Default Setting Menu
No Signal Off 4 min.	-	User	STX	P	N	4	-	-	-	-	ETX	5	ACK	CR	4	3	Default Setting Menu
No Signal Off 5 min.	-	User	STX	P	N	5	-	-	-	-	ETX	5	ACK	CR	5	3	Default Setting Menu
No Signal Off 6 min.	-	User	STX	P	N	6	-	-	-	-	ETX	5	ACK	CR	6	3	Default Setting Menu
No Signal Off 7 min.	-	User	STX	P	N	7	-	-	-	-	ETX	5	ACK	CR	7	3	Default Setting Menu
No Signal Off 8 min.	-	User	STX	P	N	8	-	-	-	-	ETX	5	ACK	CR	8	3	Default Setting Menu
No Signal Off 9 min.	-	User	STX	P	N	9	-	-	-	-	ETX	5	ACK	CR	9	3	Default Setting Menu
No Signal Off 10 min.	-	User	STX	P	N	A	-	-	-	-	ETX	5	ACK	CR	10	3	Default Setting Menu
No Signal Off 20 min.	-	User	STX	P	N	B	-	-	-	-	ETX	5	ACK	CR	11	3	Default Setting Menu
No Signal Off 30 min.	-	User	STX	P	N	C	-	-	-	-	ETX	5	ACK	CR	12	3	Default Setting Menu
No Signal Off 40 min.	-	User	STX	P	N	D	-	-	-	-	ETX	5	ACK	CR	13	3	Default Setting Menu
No Signal Off 50 min.	-	User	STX	P	N	E	-	-	-	-	ETX	5	ACK	CR	14	3	Default Setting Menu
No Signal Off 60 min.	-	User	STX	P	N	F	-	-	-	-	ETX	5	ACK	CR	15	3	Default Setting Menu
Power On Manual	-	User	STX	A	P	0	-	-	-	-	ETX	5	ACK	CR	0	3	Default Setting Menu
Power On Auto	-	User	STX	A	P	1	-	-	-	-	ETX	5	ACK	CR	1	3	Default Setting Menu
Lamp Power Standard	-	User	STX	L	P	H	-	-	-	-	ETX	5	ACK	CR	1	3	Default Setting Menu
Lamp Power Low	-	User	STX	L	P	L	-	-	-	-	ETX	5	ACK	CR	0	3	Default Setting Menu
Burn In Mode Off/Stop *8	-	Factory	STX	B	O	F	-	-	-	-	ETX	5	ACK	CR	0	3	Burn In Mode Menu
Signal Mode Group (RS232C Signal Mode State)																	
Signal Format Auto	-	User	STX	S	G	0	-	-	-	-	ETX	5	ACK	CR	0	3	Auto Setting Menu YPbPr
Signal Format 480i@60	-	User	STX	S	G	1	-	-	-	-	ETX	5	ACK	CR	1	3	Auto Setting Menu YPbPr
Signal Format 480p@60	-	User	STX	S	G	2	-	-	-	-	ETX	5	ACK	CR	2	3	Auto Setting Menu YPbPr
Signal Format 576i@50	-	User	STX	S	G	3	-	-	-	-	ETX	5	ACK	CR	3	3	Auto Setting Menu YPbPr
Signal Format 576p@50	-	User	STX	S	G	4	-	-	-	-	ETX	5	ACK	CR	4	3	Auto Setting Menu YPbPr
Signal Format 720p@50	-	User	STX	S	G	5	-	-	-	-	ETX	5	ACK	CR	5	3	Auto Setting Menu YPbPr
Signal Format 720p@60	-	User	STX	S	G	6	-	-	-	-	ETX	5	ACK	CR	6	3	Auto Setting Menu YPbPr
Signal Format 1152i@50	-	User	STX	S	G	7	-	-	-	-	ETX	5	ACK	CR	7	3	Auto Setting Menu YPbPr
Signal Format 1035i@60	-	User	STX	S	G	8	-	-	-	-	ETX	5	ACK	CR	8	3	Auto Setting Menu YPbPr
Signal Format 1080i@50	-	User	STX	S	G	9	-	-	-	-	ETX	5	ACK	CR	9	3	Auto Setting Menu YPbPr
Signal Format 1080i@60	-	User	STX	S	G	A	-	-	-	-	ETX	5	ACK	CR	10	3	Auto Setting Menu YPbPr
Video Mode Auto	-	User	STX	K	V	0	-	-	-	-	ETX	5	ACK	CR	0	3	Auto Setting Menu Video
Video Mode NTSC	-	User	STX	K	V	1	-	-	-	-	ETX	5	ACK	CR	1	3	Auto Setting Menu Video
Video Mode PAL	-	User	STX	K	V	2	-	-	-	-	ETX	5	ACK	CR	2	3	Auto Setting Menu Video
Video Mode SECAM	-	User	STX	K	V	3	-	-	-	-	ETX	5					

Command List

Function	In Standby	Use	Command Packet										Byte	Reply Packet				Byte	Same Function in Menu & Key
			Ascii	Char	Char	Char	Data1	Data2	Data3	Data4	Ascii		Ascii	Ascii	Data 1	Data2			
Cancel Muting	-	User	STX	M	O	F	-	-	-	-	ETX	5	ACK	CR	0	-	3	MUTE Key	
Freeze	-	User	STX	F	O	N	-	-	-	-	ETX	5	ACK	CR	1	-	3	FREEZE Key	
Cancel Freezing	-	User	STX	F	O	F	-	-	-	-	ETX	5	ACK	CR	0	-	3	FREEZE Key	
Resize Up	-	User	STX	R	U	P	-	-	-	-	ETX	5	ACK	CR	0	-	3	RESIZE UP Key	
Resize Down	-	User	STX	R	D	W	-	-	-	-	ETX	5	ACK	CR	0	-	3	RESIZE DOWN Key	
Move Up	-	User	STX	P	O	1	-	-	-	-	ETX	5	ACK	CR	0	-	3	UP Key	
Move Down	-	User	STX	P	O	2	-	-	-	-	ETX	5	ACK	CR	1	-	3	DOWN Key	
Move Left	-	User	STX	P	O	3	-	-	-	-	ETX	5	ACK	CR	2	-	3	LEFT Key	
Move Right	-	User	STX	P	O	4	-	-	-	-	ETX	5	ACK	CR	3	-	3	RIGHT Key	
Cancel Rising	-	User	STX	R	S	O	-	-	-	-	ETX	5	ACK	CR	0	-	3	RESIZE OFF Key	
Burn In Mode On/Reset/Start *9	-	Factory	STX	B	O	N	-	-	-	-	ETX	5	ACK	CR	1	-	3	Burn In Mode Menu	
Special Source Group (Next State After Execution = Select Input Source State)																			
Input Source RGB	-	User	STX	I	N	1	-	-	-	-	ETX	5	ACK	CR	1	-	3	Input Select Menu	
Input Source YPbPr	-	User	STX	I	N	2	-	-	-	-	ETX	5	ACK	CR	2	-	3	Input Select Menu	
Input Source Video	-	User	STX	I	N	3	-	-	-	-	ETX	5	ACK	CR	3	-	3	Input Select Menu	
Input Source S-Video	-	User	STX	I	N	4	-	-	-	-	ETX	5	ACK	CR	4	-	3	Input Select Menu	
Special Test Pattern Group (Next State After Execution = Test Pattern State)																			
Test Pattern Dot/Cross *7	-	Factory	STX	T	P	1	-	-	-	-	ETX	5	ACK	CR	1	-	3	Test Pattern Menu	
Test Pattern 32 Step *7	-	Factory	STX	T	P	2	-	-	-	-	ETX	5	ACK	CR	2	-	3	Test Pattern Menu	
Test Pattern 4x4 Black/White *7	-	Factory	STX	T	P	3	-	-	-	-	ETX	5	ACK	CR	3	-	3	Test Pattern Menu	
Special Video Curtain Group (Next State After Execution = Video Curtain State)																			
Video Curtain Red *7	-	Factory	STX	V	C	1	-	-	-	-	ETX	5	ACK	CR	1	-	3	Video Curtain Menu	
Video Curtain Green *7	-	Factory	STX	V	C	2	-	-	-	-	ETX	5	ACK	CR	2	-	3	Video Curtain Menu	
Video Curtain Blue *7	-	Factory	STX	V	C	3	-	-	-	-	ETX	5	ACK	CR	3	-	3	Video Curtain Menu	
Video Curtain Black *7	-	Factory	STX	V	C	4	-	-	-	-	ETX	5	ACK	CR	4	-	3	Video Curtain Menu	
Spoke Light *7	-	Factory	STX	V	C	5	-	-	-	-	ETX	5	ACK	CR	5	-	3	Video Curtain Menu	
Special Group (Next State After Execution = Normal State / Standby State)																			
Test Pattern Off *7	-	Factory	STX	T	P	F	-	-	-	-	ETX	5	ACK	CR	0	-	3	Test Pattern Menu	
Video Curtain Off *7	-	Factory	STX	V	C	F	-	-	-	-	ETX	5	ACK	CR	0	-	3	Video Curtain Menu	
Initialize Factory Data *4	Acceptable	Factory	STX	I	U	A	-	-	-	-	ETX	5	ACK	CR	0	-	3	-	
Initialize Keystone Calibration	Acceptable	Factory	STX	I	U	K	-	-	-	-	ETX	5	ACK	CR	0	-	3	Keystone Calibration Menu	
Initialize ADC Level Alignment	Acceptable	Factory	STX	I	U	S	-	-	-	-	ETX	5	ACK	CR	0	-	3	ADC Level Alignment Menu	
Initialize CW Delay Alignment	Acceptable	Factory	STX	I	U	C	-	-	-	-	ETX	5	ACK	CR	0	-	3	Color Wheel Delay Menu	
Initialize White Peak (All Data)	Acceptable	Factory	STX	I	U	W	-	-	-	-	ETX	5	ACK	CR	0	-	3	White Peak Menu (Each Data)	
Initialize RGB Gain (DDP1000)	Acceptable	Factory	STX	I	U	G	-	-	-	-	ETX	5	ACK	CR	0	-	3	RGB Gain (DDP1000)	
Initialize Lamp Time	Acceptable	Factory	STX	I	U	T	-	-	-	-	ETX	5	ACK	CR	0	-	3	Lamp Time Menu	
Initialize Error & Burn In Data	Acceptable	Factory	STX	I	U	E	-	-	-	-	ETX	5	ACK	CR	0	-	3	Burn In Mode Menu	
Save Data (Except User Data)	Acceptable	Factory	STX	F	S	V	-	-	-	-	ETX	5	ACK	CR	0	-	3	-	
Keystone Calibration 0	Acceptable	Factory	STX	K	C	0	-	-	-	-	ETX	5	ACK	CR	0	-	3	Keystone Calibration Menu	
Keystone Calibration 1	Acceptable	Factory	STX	K	C	1	-	-	-	-	ETX	5	ACK	CR	1	-	3	Keystone Calibration Menu	
Keystone Calibration 2	Acceptable	Factory	STX	K	C	2	-	-	-	-	ETX	5	ACK	CR	2	-	3	Keystone Calibration Menu	
Keystone Calibration 3	Acceptable	Factory	STX	K	C	3	-	-	-	-	ETX	5	ACK	CR	3	-	3	Keystone Calibration Menu	
Auto Sub Contrast *5	-	Factory	STX	A	S	C	-	-	-	-	ETX	5	ACK	CR	0	-	3	ADC Level Alignment Menu	
Auto Sub Brightness *6	-	Factory	STX	A	S	B	-	-	-	-	ETX	5	ACK	CR	0	-	3	ADC Level Alignment Menu	
Get Lamp List	Acceptable	Factory	STX	T	M	L	-	-	-	-	ETX	5	ACK	CR	11 Word Data *3		24	-	
Get Error List	Acceptable	Factory	STX	E	R	L	-	-	-	-	ETX	5	ACK	CR	19 Byte Data *3		21	Burn In Mode Menu	
Get Burn In Timer	Acceptable	Factory	STX	B	T	R	-	-	-	-	ETX	5	ACK	CR	4 Byte Data *3		6	Burn In Mode Menu	
Read PW164B Register	Acceptable	Factory	STX	Q	0	0	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write PW164B Register	Acceptable	Factory	STX	N	0	0	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read AD9888 Register	-	Factory	STX	Q	0	1	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write AD9888 Register	-	Factory	STX	N	0	1	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read VPX3226E Register	-	Factory	STX	Q	0	2	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write VPX3226E Register	-	Factory	STX	N	0	2	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read DDP1000 Register	-	Factory	STX	Q	0	3	Word Addr *1		-	-	ETX	7	ACK	CR	15 Byte Data *2		17	-	
Write DDP1000 Register	-	Factory	STX	N	0	3	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read G768B Register	Acceptable	Factory	STX	Q	0	4	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write G768B Register	Acceptable	Factory	STX	N	0	4	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read G760 Register	Acceptable	Factory	STX	Q	0	5	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write G760 Register	Acceptable	Factory	STX	N	0	5	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read G767A Register	Acceptable	Factory	STX	Q	0	6	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write G767A Register	Acceptable	Factory	STX	N	0	6	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read AD5301 Register	Acceptable	Factory	STX	Q	0	7	Word Addr *1		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write AD5301 Register	Acceptable	Factory	STX	N	0	7	Word Addr *1		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read G751 Register	Acceptable	Factory	STX	Q	0	8	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write G751 Register	Acceptable	Factory	STX	N	0	8	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read AT24C16 Register	Acceptable	Factory	STX	Q	0	9	Word Addr (MSB 1st)		-	-	ETX	7	ACK	CR	Word Data (MSB 1st)		4	-	
Write AT24C16 Register	Acceptable	Factory	STX	N	0	9	Word Addr (MSB 1st)		Word Data (MSB 1st)		-	ETX	9	ACK	CR	0	-	3	-
Read User Data	Acceptable	Factory	STX	X	0	0	Offset (MSB 1st)		-	-	ETX	7	ACK	CR	Byte Data		-	3	-
Read Factory Data	Acceptable	Factory	STX	X	0	1	Offset (MSB 1st)		-	-	ETX	7	ACK	CR	Byte Data		-	3	-
Read Lamp Data	Acceptable	Factory	STX	X	0	2	Offset (MSB 1st)		-	-	ETX	7	ACK	CR	Byte Data		-	3	-
Read Error & Burn In Mode Data	Acceptable	Factory	STX	X	0	3	Offset (MSB 1st)		-	-	ETX	7	ACK	CR	Byte Data		-	3	-
Read System Data RAM	Acceptable	Factory	STX	X	0	4	Offset (MSB 1st)		-	-	ETX	7	ACK	CR	Byte Data		-	3	-
Get Firmware Version	Acceptable	Factory	STX	V	E	R	-	-	-	-	ETX	5	ACK	CR	Firmware Version		4	Status Display	
Get GUI Version	Acceptable	Factory	STX	G	U	I	-	-	-	-	ETX	5	ACK	CR	GUI Version		4	Status Display	

*1 Device does not have a sub-address. Fix data to 0x0000.

*2 DDP1000 returns 15-byte data.

*3 Timer list size is 11-word (22-byte). Error list size is 19-byte. Burn in timer is 4-byte.

*4 Factory Data = Keystone Calibration, ADC Level Alignment, CW Delay Alignment, White Peak & RGB Gain (DDP1000)

*5 This command is effective only when a screen size is FULL mode and an input source is RGB.

*6 This command is effective only when a screen size is FULL mode and an input source is RGB/YPbPr.

*7 While displaying a test pattern or a video curtain, operation is not acceptable except IPF and VCF commands.

*8 This command is acceptable only when the burn in mode is ON.

*9 This command is acceptable only when the burn in mode is OFF. Execution of this command initializes burn in timer, error counters, error log and shutdown counter.

Note: A command cannot be executed when a projector is busy. In this case, there is no reply or an escape code returns.

Communication Examples

Contrast Adjustment
Choose contrast adjustment
Increase contrast value
Decrease contrast value

Order

1
2
2

Command

STX	V	C	N	ETX
STX	A	R	G	ETX
STX	A	L	F	ETX

Reply

ACK	CR	0 - 31
ACK	CR	0 - 31
ACK	CR	0 - 31

Language Setting

Choose English
Choose Japanese

Order

-
-

Command

STX	L	E	N	ETX
STX	L	J	P	ETX

Reply

ACK	CR	0
ACK	CR	6

AD9888 Register Control

Read register
Write register

Order

-
-

Command

STX	Q	0	1	Word Addr (MSB 1st)	ETX	
STX	N	0	1	Word Addr (MSB 1st)	Word Data (MSB 1st)	ETX

Reply

ACK	CR	Word Data (MSB 1st)
ACK	CR	0

Communication Format

RS232C, 9600bps, No Parity, Data Length: 8-bit, Stop Bit Length: 1-bit

RS232C Command List for TOSHIBA DLP Projector TDP-D1

Rev. K 2003.1.7

Reply of Error List Command

Ascii	Ascii	Data1	Data2	Data3	Data4	Data5	Data6	Data7	Data8	Data9	Data10	Data11	Data12	Data13	Data14	Data15	Data16	Data17	Data18	Data19
ACK	CR	Shutdown Count	Lamp Error Count	Fan 1 Speed Error Count	Fan 2 Speed Error Count	Fan 3 Speed Error Count	Fan 1 Temp. Error Count	Fan 2 Temp. Error Count	Fan 3 Temp. Error Count	Device Error Count	Error Log 1	Error Log 2	Error Log 3	Error Log 4	Error Log 5	Error Log 6	Error Log 7	Error Log 8	Error Log 9	Error Log 10

New <-----> Old

Description	
Lamp Error Count	The count of the lamp error. This error will occur, if the LAMPLIT signal is low.
Fan X Speed Error Count	The count of the fan speed error. This error will occur, if the speed of the fan x is too low.
Fan X Temp Error Count	The count of the fan temp error. This error will occur, if the temperature of the fan x is too high.
Device Error Count	The count of the device error. This error will occur, if devices are wrong. (ex: Video decoder reset error)
Error Log [10]	The log list of error. The error log [1] is the newest.

Error Type	Number for Error Log	
Lamp Error	1	
Fan 1 Speed Error	2	: Lamp Fan
Fan 2 Speed Error	3	: Ballast Fan
Fan 3 Speed Error	4	: Blower Fan
Fan 1 Temp. Error	5	: DMD Temp.
Fan 2 Temp. Error	6	: Lamp Temp.
Fan 3 Temp. Error	7	: Fan Board Temp.
Device Error	8	

Reply of Lamp (Time) List Command

Ascii	Ascii	Data1	Data2	Data3	Data4	Data5	Data6	Data7	Data8	Data9	Data10	Data11	Data12	Data13	Data14	Data15	Data16	Data17	Data18	Data19	Data20	Data21	Data22
ACK	CR	Reset Count		Reset Time 1 (MSB 1st)		Reset Time 2 (MSB 1st)		Reset Time 3 (MSB 1st)		Reset Time 4 (MSB 1st)		Reset Time 5 (MSB 1st)		Reset Time 6 (MSB 1st)		Reset Time 7 (MSB 1st)		Reset Time 8 (MSB 1st)		Reset Time 9 (MSB 1st)		Reset Time 10 (MSB 1st)	

New <-----> Old

Description	
Reset Count	The count of user reset.
Reset Time [10]	The time list of user reset. This shows the time interval of reset. The reset time [1] is the newest.

Reply of Burn In Timer Command

Ascii	Ascii	Data1	Data2	Data3	Data4
ACK	CR	Hours (MSB 1st)	Minutes	Seconds	

Appendix A Engineering Specification

1.0 Optical Performance	Tested under 40" (diagonal) image size with Wide projection lens position and "SPOKE mode" unless otherwise specified. Measurement Details refer to Appendix A.		
1.1 ANSI Brightness	Spoke mode		
1.1.1 Typical	TBD (Toshiba wish 2000) (reference)		
1.1.2 Minimum	1750 Lumens (Toshiba wish 1750+1~3% for measuring tolerance)		
1.1.3 Eco mode Minimum	TBD Lumens (Toshiba agreed this specification for reference and can have a large margin for good yield rate.) (Reference)		
1.2 Brightness Uniformity (A2)	Spoke mode		
1.2.1 Typical	>60% (reference)		
1.2.2 Minimum	>54% (before Brightness up solution phase in) >50% (after Brightness up solution phase in)		
1.3 Contrast Ratio			
1.3.1 ANSI Contrast			
1.3.1.1 Typical	200:1 (reference)		
1.3.1.2 Minimum	100:1		
1.3.2 JBMA Contrast	Spoke mode		
1.3.2.1 Typical	800:1 (reference)		
1.3.2.2 Minimum	700:1		
1.4 Light Leakage			
1.4.1 Light Leakage in Active Area (A22)	<3 lux within 40" (diagonal) image size		
1.4.2 Light Leakage out of Active Area	<5 lux between of 40" (diagonal) image size and within Customer defined area (A17)		
1.4.3 Blue Border (A23)	<1 lux with 60" (diagonal) image size		
1.4.4 Purple Border (A23)	<2 lux with 60" (diagonal) image size		
1.5 Customer Defined Color (A19) Spoke mode	Tentative values. Real specification will be modified after EPR data is collected!		
1.5.1 White (TBD)	Min	Typ	Max

1.5.1.1 Color Temperature	5600	7600	11000
1.5.1.2 Color Deviation	-0.0050	0.010	0.0270
	x (Toshiba CL-200)		y (Toshiba CL-200)
1.5.4 Red (TBD)	.640±.030		.340±.030
1.5.5 Green(TBD)	.335±.035		.555±.040
1.5.6 Blue(TBD)	.137±.030		.087±.030
1.6 Customer Defined Color Uniformity (A18)	duv		
1.6.1 White	0.020		
1.6.2 Red	0.020		
1.6.3 Green	0.020		
1.6.4 Blue	0.020		
2.0 Image Quality			
2.1 Throw Ratio	60”±2” Diagonal at 2m, Wide		
2.2 Zoom Ratio (tolerance applied)	Distance	Wide/Tele	
	1.50m(min)	45/37	
	2.00m	60/49	
	3.33m	100/82	
	6.00m(max)	180/148	
2.3 Distortion			
2.3.1 Keystone Distortion	<1.0%		
2.3.2 Vertical TV Distortion	<1.0%		
2.4 Projection Offset	132% ±5%		
2.5 Focus Range	1.5~6m		
2.6 Customer Defined Focus (A20)	Refer to A20		
2.7 Lateral Color (A21)	Refer to A21		
2.8 DMD Image Quality	See Appendix D		
2.9 Shading at edge of image, Dust and other image quality issue	According to agreed limit sample under discussion between Customer and BenQ if problem happen		
3.0 Mechanical Specification			
3.1 Dimensions	248 x 200 x 75 mm (L x W x H)		
3.2 Weight	2.3 kg ± 100g		
3.3 Security Slot	Kensington compatible slot 150N break away force		

3.5 Lens Cover	Detached Lens Cover	
3.6 Feet	Fast adjustable foot in front, Adjustable foot and Fixed foot in rear. Foot Tilt:0-6,right/left: 0-4.	
3.7 Handle	NA	
4.0 Packaging	Detail refer to C309 (Packing Description)	
4.1 Outside Dimensions	460 x 455 x 292mm (L x W x H) (TBD, AT LEAST SMALLER THAN 4.1)	
4.2 Weight	4.2 Kg (Including Accessories, Projector) (TBD, AT LEAST LIGHTER THAN 4.2)	
4.3 Palletization	20 by Air; 728 / 40' container, or 336/20' container by sea (TBD, AT LEAST MORE THAN 4.3)	
5.0 Thermal Specification	Maximum temperature rise (Delta T) (UL1950)	
5.1 Handles, knobs, grips, etc. and surface Held or touched for short periods only	Metal	Plastic
	35°C	60°C
5.2 External surface or equipment which may be touched	Metal	Plastic
	45°C	70°C
5.3 Exhaust Air	70°C	
6.0 Environmental (TBD)	Adhere to Appendix B	
6.1 Temperature	Operating	10 - 40°C, without condensation
	Storage	-10 - 60°C, without condensation
6.2 Humidity	Operating	10 - 90%RH, without condensation
	Storage	10 - 90%RH, without condensation
6.3 Audible Noise Level (Appendix C)	Typical	Normal mode: 37dBA at @ 25°C Eco mode: TBD dBA @ 25°C
	Maximum	Normal mode: 38dBA at @ 25°C
6.4 Altitude	0 – 6000 feet above sea level	
6.5 Shock	Refer to Appendix B	
6.6 Drop	Refer to Appendix B	
6.7 Vibration	Refer to Appendix B	
7.0 Regulatory (TBD)	Safety	UL Approved (UL 1950, CSA950), TUV-GS, CCIB, CB Report
	EMC	FCC Class B requirements, BSMI, VCCI, C-Tick
	CE Marks	Directive 73/23/EEC;
		Directive 89/336/EEC;

	ESD	BENQ ESD Specification
8.0 Reliability		
8.1 General Failure Def.	Adhere to Appendix B	
8.2 MTBF	20000 hours except for DMD chip, Color wheel, Lamp and Fan	
8.3 Lamp Lifetime (TBD)	1500 hours (50% brightness maintenance)	
9.0 Power Requirements	Adhere to Appendix F	
9.1 Power Supply (Normal)	VAC 100 – 240 Auto0-switch (50/60Hz), 3 Wire Grounded	
9.2 Power Consumption	Typical	340W
	Standby	15W
9.3 Power Connector	IEC	
10.0 Panel Specification		
10.1 Type	Single Chip 0.7” XGA 12° tilt DDR DMD	
10.2 Pixels	H: 1024 X V: 768	
10.3 Color Depth	24 Bits (16770000 colors)	
11.0 Compatibility	System firm ware is provided by Customer	
11.1 DDC	DDC 2B	
12.0 Image Interface	Adhere to Appendix E.2	
12.1 Analog RGB Input	15 pin D-Sub (Female) x 1 RGB: Video amplitude 1.0 V _{p-p} : Impedance 75Ω HD/VD/CS: TTL Level	
12.2 Video Input	RCA jack (Yellow) Video amplitude 1.0 V _{p-p} : Impedance 75Ω	
12.3 S-Video Input	4 pin Mini-Din (Female) Y: Luminance amplitude 1.0 V _{p-p} : Impedance 75Ω C: Chroma amplitude 0.268 V _{p-p} : Impedance 75Ω	
12.4 YPbPr Input	15 pin D-Sub (Female) x 1 Y: Luminance amplitude 1.0 V _{p-p} : Impedance 75Ω PbPr/C _b C _r : Chroma amplitude 0.7 V _{p-p} : Impedance 75Ω	
12.5 Analog RGB Output	15 pin D-Sub (Female) x 1 RGB: Video amplitude 1.0V _{p-p} : Impedance 75Ω HD/VD/CS: TTL Level	
13.0 Control Interface		
13.1 IR Receiver	IR Receiver x2 (Front, Rear) Angle: 15°	
13.2 Serial Connector	15 pin D-Sub (Female) x 1 (the same as Analog RGB	

	Input) RS-232 Standard
13.3 USB Connector	B type USB terminal for mouse port
14.0 User Interface	Adhere to Appendix E.3
14.1 Operator Keypad	9 Keys:
14.2 Indicators	4 dual LEDs
14.3 Remote Control	General Type Remote with Laser
15.0 Audio	
15.1 PC Audio Input	$\Phi 3.5\text{mm}$ stereo mini jack $350\text{mV}_{\text{rms}}$ 10 K Ω or more
15.2 PC Audio Output	$300\text{mV}_{\text{rms}}$ 10 K Ω or more
15.3 Speaker	4 Ω 3W x 1
16.0 Others	For any unspecified problem, Customer and BenQ shall discuss and/or use limit sample to determine the specification if needed.

Appendix B Circuit operation Theroy

Main Frame Introduction

This introduction provides detailed design information to assist in rapid development of a board design and layout, and covers the following topics:

- . Analog RGB Interface
- . Video Interface
- . Microprocessor Interface
- . ImageProcessor Interface
- . Display Interface
- . Power Considerations

Analog RGB Interface

The first area of concern when using an Analog RGB Interface is the proper, clean, non-interfering connection of DVI and analog RGB signals on the same circuit board. Second, with these high-speed, low-amplitude interfaces, any power supply interference must be removed or reduced as much as possible. Red, green, and blue analog data are typically received through a 15-pin “DIN” connector. This is carried over from the original computer-to-display interface systems developed in the early 1970s. While the system worked well then, it was never intended for the signals on today’s graphics cards that operate at 160MHz with 2.7mV per grayscale level performance. In addition, ESD and EMI considerations also influence interface decisions to improve system reliability. The designers of this original interface did, however, consider cross-talk issues. Therefore, care was taken to provide a separate signal ground pin for each signal pin whenever or wherever possible. This fact must be remembered when laying out components.

This section provides design guidelines for the RGB Analog interface, and describes:

- . Input Signals
- . Sync on Green (SOG)
- . Power
- . Clocks and Phase Lock Loop (PLL)
- . Layout

Input Signals

Care must be taken to minimize input capacitance while reducing sensitivity to noise on the input. These are opposing themes when attempting to customize the input for specific performance. To attempt to satisfy these goals, consider the following guidelines:

- . Keep the input termination impedance $75\ \Omega$ at frequencies up to twice the display design goal. To do so, use an inductance to balance the board stray capacitance. This reduces unwanted termination reflections at the frequencies of interest.
- . The actual termination resistor needs to have its ground return point as close to the 15-pin connector as possible.
- . After this initial termination, the circuit board appears as a high-impedance subsystem with a large amount of stray capacitance. This stray capacitance comes primarily from the ESD protection devices and the input circuit to the display processor. This capacitance can again be balanced out with the proper amount of series inductance prior to the ESD protection device.
- . Keep signal trace width as narrow as possible for these analog signals; the reason for this is that the wider the trace, the higher the stray capacitance. Also, after the initial $75\ \Omega$ termination, the subsystem needs to be considered high impedance.

Figure 1 shows a generic approach to resolving input signal design considerations.

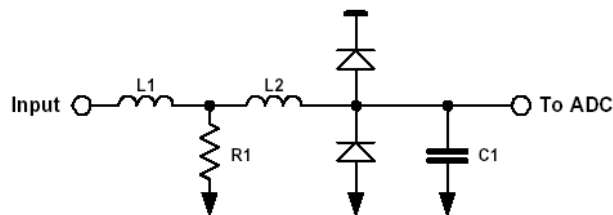


Figure 1. Analog RGB Input Circuit

Place L1 as close to the connector pin as possible to reduce reflections. The stray capacitance is not shown. R1 is the 75 Ω termination resistance, and its ground point needs to be placed as close as possible to the input connector signal ground return. L2 becomes the balancing inductor for the high impedance subsystem. The undesignated diodes represent the ESD protection devices. C1 is used to match the impedance of the final input circuit to 75 Ω at the frequency of interest, and to reduce signal bandwidth to remove frequencies above the input data rate. The inductor and capacitor values for each individual system will vary with layout and component choices. Typically, L1 and L2 are specified as 40 nH @ 100MHz and C1 as 12pF.

Sync on Green (SOG)

Another carry -over from the past is Sync on Green (SOG). In this situation, an added input to the display processor is available. This needs to be connected to the green channel of the analog RGB, which adds capacitance to the green channel. Doing so typically affects L2 or C1 (shown in Figure 1) for the green channel only. As one might believe, matching the SOG subsystem capacitance improves system performance. The suggested circuit configuration shown in Figure 1 creates a specific element of phase delay. This delay is not harmful if all three channels have similar delay numbers. Any variation in the delay from one channel to the next greater than 2% of the maximum pixel cycle time influences apparent phase noise and can create improper color reproduction. This is especially true for the green channel, where the SOG burden influences its delay differently from the red or blue channels.

Many ADCs support SOG separation internally. If an external sync separation circuit is required, a National LM1881 (or equivalent) circuit works well up to XGA resolutions. Use a high-speed comparator for higher resolutions.

Power

The type of analog circuitry used for these high-speed interfaces can be sensitive to power supply variations. It has been determined through empirical experimentation that ripple on a given supply of only 5mV p-p can be seen in the display image. This ripple is typically at a resonant point for the RGB subsystem, such as the vertical, horizontal, or pixel frequency rates, or a sub-harmonic or harmonic frequency. To remove these effects, it is mandatory that you use low-ripple supplies with good L/C isolation decoupling circuits. These decoupling circuit grounds must be returned to the power supply subsystem and kept isolated from the input analog subsystem. Also, remember that the display processor has a large digital processing subsystem. These power supplies and their associated grounds also need to be isolated from anything analog. Many display designers use separate linear regulators for analog subsystems. These linear regulators can remove switching noise from the power planes. In general, using separate ground planes is not a proper way to isolate analog circuitry from the power supply or digital sections of a design. Instead, it is best to direct the decoupling return through the shortest possible path to its source. Power planes, however, should be kept out of areas where the power is not needed. For example, do not allow a power plane to lie below or above the RGB signal subsystem. This reduces stray capacitance while reducing possible noise injection. The critical power design considerations are:

Isolate the power supplied to the ADC and PLL (analog power) from the power supplied to the digital portions of the circuit board. Isolate the power planes for these portions of the circuit board from the digital power plane, although they all can be on the same layer. Use a linear regulator to supply these voltages to reduce the risk of switching noise being present on the plane.

Clocks and Phase Lock Loop (PLL)

Consider a PLL as a servo loop, such a person controlling the speed of a car with the accelerator. As more people talk in the car (or other distractions that may occur) the more the person instinctively attempts to block them out. In a sense, this shortens the loop between the mind and the foot of the driver, thus reducing noise influences. The PLL needs this same type of attention to path detail. The loop filter passive components must be kept as close to the VCO control pin as possible. They can be placed on either side of the board as long as no noise producing components are in the immediate vicinity.

Video Interface

This section provides design guidelines for the Video interface, and describes:

- . Input Signals
- . Power
- . Clocks
- . Output Signals

Input Signals

The AC-coupled video interface inputs may or may not need diodes, depending on the requirements of the video decoder used. Keep these signals on the outside surfaces of board next to the ground plane, as short as possible, and away from other signals.

Power

The critical power design considerations are:

- . Isolate the power supplied to the analog portions of the video decoder from the power supplied to the digital portions of the circuit board.
- . Isolate the power planes for the analog portions of the circuit board from the digital power plane, although they all can be on the same layer.
- . Use a linear regulator to supply these voltages to reduce the risk of switching noise being present on the plane.

Clocks

Carefully chose the crystal for the video decoder. Use the crystal specified on the decoder manufacturer's data sheet. A crystal that operates at the correct frequency is critical for proper video decoding.

Output Signals

Use series terminating resistors on the clock, sync, and data outputs of the Video Decoder to greatly reduce EMI effects. These resistors reduce the amount of current the Video Decoder must source for these signals, which may increase its accuracy. Place the resistors as close to the source as possible, because there are up to 24 bits of data. Route these signals as directly as possible. If the decoder supports 16-bit YUV, use this mode instead of the 24-bit RGB. The 16-bit YUV mode uses fewer signals and has the same signal quality. Video Decoders have 2X or 1X output clocks. If a 2X clock is used, another signal (DEN) is required to indicate which phase of the 2X clock to use. Some Video Decoders have built-in image scaling capability. To take advantage of this capability, connect the DEN output from the Video Decoder to the VPEN input of the ImageProcessor so that the ImageProcessor knows which output pixels are valid.

Microprocessor Interface

This section provides design guidelines for the Microprocessor interface, and describes:

- . Read-Only Memory (ROM)
- . External SRAM (Optional)
- . Nonvolatile RAM
- . Debugger Interface
- . ROM Emulator Connector
- . Reset and NMI

Read-Only Memory (ROM)

The ImageProcessor requires a ROM to hold firmware for the on-chip CPU. Typical ROM sizes are 4Mbits or 8Mbits. The ROM device can be Flash, OTP PROM, or Mask ROM. Flash devices allow in-system reprogramming. . Connect the ROM address and data buses to the ImageProcessor address and data buses.

. Connect the OE pin of the ROM to the ImageProcessor ROMOE pin.

. For FLASH devices, connect the WE pin to the ImageProcessor ROMWE pin.

A 16-bit data bus is required. ROMs used with Pixelworks ImageProcessors should have an access time of less than 150 ns.

External SRAM (Optional)

ImageProcessors can use external Static RAM (SRAM) for the processor's local memory. This is required only for applications where extremely complex user interfaces or other custom software is used that requires more than the 32K of processor memory available on-chip. In these cases, the SRAM can be connected to the ImageProcessor without external glue logic. RAMs used with Pixelworks ImageProcessors should have an access time of less than 150 ns. Refer to the ImageProcessor Evaluation Board schematics for details about how this part is connected.

Non-Volatile RAM

The Pixelworks ImageProcessor requires a serial EEPROM for Non-Volatile Random Access Memory (NVRAM) to save user settings. The NVRAM is typically 16K-bits or 32K-bits.

Debugger Interface

ImageProcessor software development requires the use of a debugging system that employs a ROM emulator. The ROM emulator replaces the system ROM, which is disabled. The ROM emulator gets all the same signals as the system ROM. Debugging also requires a reset line and a Non Maskable Interrupt (NMI) line.

RESET and Non-Maskable Interrupts (NMI)

Drive the RESET pin active during power up and hold it active until after the MCLK input starts toggling. This can be accomplished by using either an RC circuit, a TLC7733 Reset IC, or the equivalent. Figure 2 shows an example of the RESET circuit used with a Pixelworks ImageProcessor. This circuit holds RESET active for 2.1 ms to allow the clock signals to stabilize.

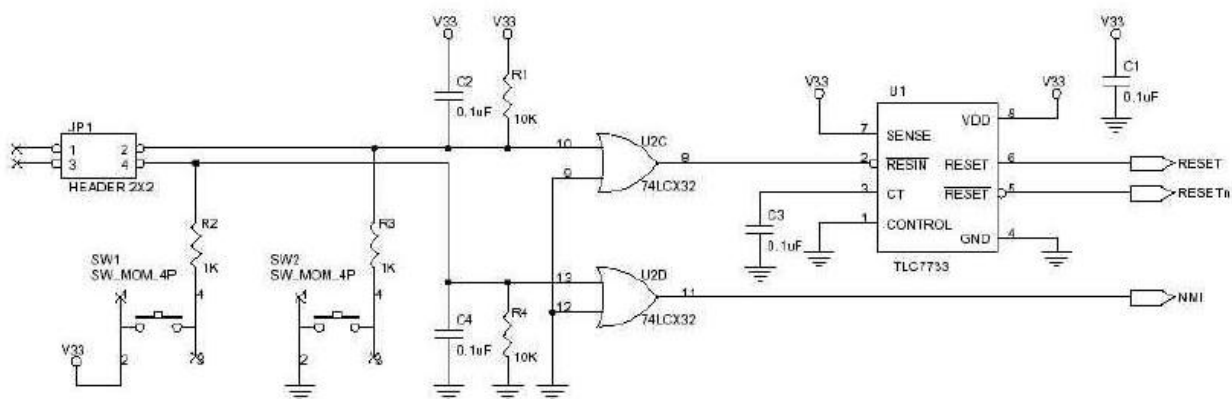


Figure 2. Sample RESET/NMI/WE Circuit

The minimum pulse width value of the RESET input defined in the ImageProcessor specification must be met. In addition, the ROM emulator needs to be able to drive the RESET pin of the ImageProcessor. An external RESET signal may be 5V CMOS and must be buffered to 3V to interface to the ImageProcessor RESET pin. The RESET and NMI inputs to the Pixelworks ImageProcessor are not 5V tolerant, therefore, ensure that these inputs are not driven above 3.3V. The Non-maskable Interrupt (NMI) is used to stop the on-chip CPU when debugging using a ROM Emulator. Connect the NMI pin of the ImageProcessor to a switch or buffered ROM Emulator NMI output.

ImageProcessor Interface

This section provides design guidelines for the ImageProcessor interface, and describes:

- . Graphics Port (GPort)
- . Video Port (VPort)
- . Microprocessor
- . Display Port (DPort)
- . Clocks
- . Power
- . Miscellaneous Pins

Graphics Port (GPort)

Block diagrams showing the signal flow between the ImageProcessor Graphics Port (GPort), the ADC, and TMDS Receiver are presented for the following combinations:

- . Integrated ADC, PLL, and SOG Separator
- . Integrated ADC, PLL, plus Separate TMDS Receiver

Integrated ADC, PLL, and SOG Separator

Figure 3 shows an integrated ADC, PLL, and SOG Separator.

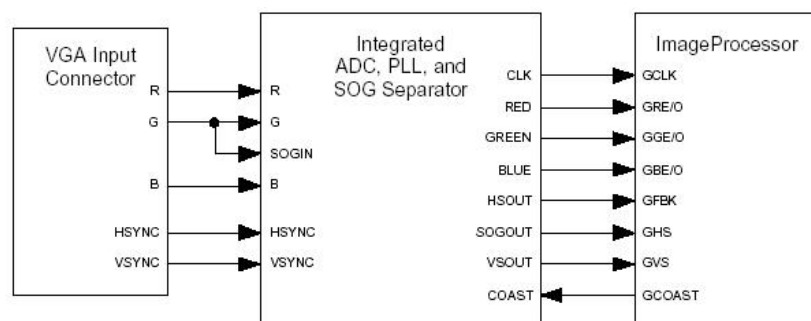


Figure 3. Integrated ADC, PLL, and SOG Separator

In this figure, HSync and VSync are sent to the ImageProcessor. These signals must be buffered to 3.3V before going to the ImageProcessor. The feedback signal (GFBK) is the HSync signal created by the PLL. After the PLL has locked on, GFBK is virtually identical to HSync, except for a phase delay. The ImageProcessor requires both of these HSync signals for two purposes:

- . HSync is not synchronous to GCLK, so GFBK is needed to indicate the start of active data.
- . GFBK is not stable until the PLL is locked, so GHS is required to measure the incoming signal so that the PLL can be initialized.

The Coast signal is sent to the PLL to tell it to free-run and ignore edges on the reference input. This is used to ignore false transitions on HSync during vertical blanking that are often present in composite sync inputs.

Video Port (VPort)

Figure 5 illustrates a sample circuit for the Video Decoder interface to the Pixelworks ImageProcessor.

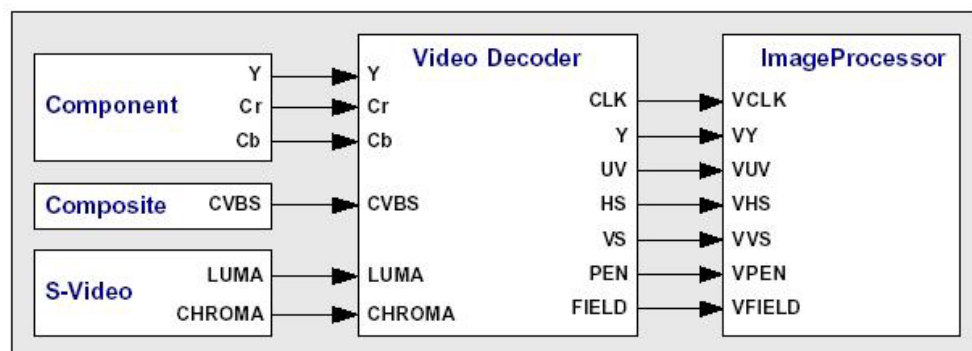


Figure 5. Sample VPort Circuit

The Video Port can receive data in 8-bit CCIR656, 16-bit YUV, 24-bit YUV, or 24-bit RGB formats. For YUV input modes, YUV to RGB conversion is performed in the Color Space Converter in the ImageProcessor. In addition, the data to the Video Port can be qualified with a VPEN input. This allows the clock to be run at a frequency faster than the data.

Microprocessor

Items that support the Microprocessor include:

- . General Purpose I/O (GPIO)
- . Decoded Chip Select (CS)
- . External Interrupts
- . Infrared (IR) Receivers
- . Universal Asynchronous Receiver Transmitter (UART)

General Purpose I/O (GPIO)

GPIO port pins can be used to implement a keypad interface and other general control functions. Pixelworks recommends using Port A0 and Port A1 as the default 2-wire serial bus. The GPIO ports are not 5V tolerant. Care should be taken to protect these pins from 5V inputs. GPIO outputs are 3.3V CMOS. These pins have 4mA output drivers. Therefore, they are not recommended to be used to directly drive LEDs or other high-current devices.

Chip Select—I/O Expansion and Other

Decoded Chip Selects (CS) are available to allow interfacing to additional external devices on the ImageProcessor bus. You can easily add additional GPIOs by using the CS line with an 8-bit latch or buffer, as shown in Figure 6. The processor bus is not 5V tolerant, so 3.3V devices or buffers must be used.

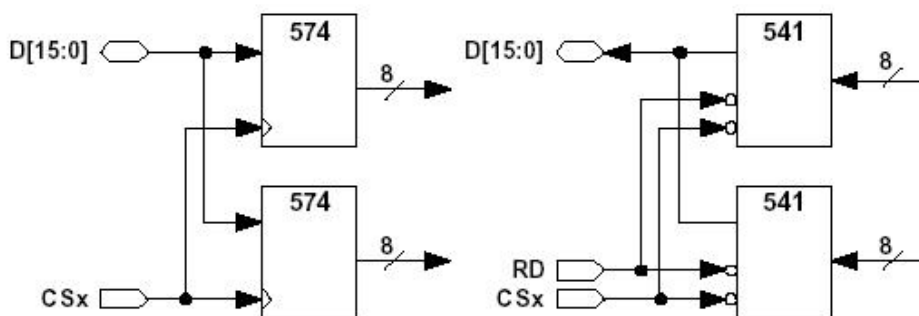


Figure 6. I/O Expansion Examples

External Interrupts

External interrupt inputs on the ImageProcessor allow the processors to be interrupted by external devices. The polarity and mode of these interrupts are programmable. Refer to the *ImageProcessor Theory of Operations*. These inputs are not 5V tolerant, so 3.3V devices or buffers must be used.

Infrared (IR) Receivers

The Infrared Receivers (IR) inputs allow IR diodes to be directly connected to the ImageProcessor. This allows IR pulses to be converted into key codes. Decoding of the signals is then handled by the ImageProcessor. These inputs are not 5V tolerant, so use 3.3V devices or buffers. The IR receiver diode outputs 5V logic. However, since the output of this diode is an open collector, and the pull-up resistance is very large (approximately 10K Ω), the potential current injected into the ImageProcessor input is very small and will cause no damage.

Universal Asynchronous Receiver Transmitter (UART)

The UART is typically used for serial communications with a PC for FLASH download and debugging. Pull down RxD if no transceiver is mounted on the board. The RxD input is not 5V tolerant.

Display Port (DPort)

The ImageProcessor Display Port (DPort) provides fully programmable timing and control signals to the LCD device. The data outputs have sufficient current to drive short internal cables. An external TMDS or LVDS transmitter can also be driven with no glue logic. If a single pixel-wide interface is used it will come out on the even pins only. The RGB data is most-significant justified when there is less than 8-bits per color. Proper series termination of all DPort signals is essential for good EMI performance.

Clocks

The ImageProcessor requires memory (MCLK) and display (DCLK) clocks. The MCLK runs the internal memory system and the on-chip CPU. The DCLK is used to generate the output display timing. These clocks are typically generated by an internal PLL-based clock generator circuit. An external crystal is required. Because the ImageProcessor is a CMOS device, the power it consumes is proportional to the speed of the input clocks. The clock inputs to the ImageProcessor are not 5V tolerant. In addition, during DPMS power down modes, the clocks should be slowed down or stopped. Refer to *Application Note # 15, Display Power Management (DPMS)*.

Display Interface

TTL

Connect TTL compatible displays directly to the ImageProcessor display port. The display port has high current drivers to drive long traces or short cables. Use series termination near the ImageProcessor for good EMI performance. If long cabling is required, buffer the DPort signals with a high drive buffer.

Fan Control Interface

The Fan Control IC contains the precise digital thermometer, fan controllers, and a system-reset circuit. The thermometer reports the temperature of 2 remote sensors and its own package. The remote sensors are diode-connected transistors typically a low-cost, easily mounted 2N3904 NPN type that replace conventional thermistors or thermocouples. Remote accuracy is $\pm 5^{\circ}\text{C}$ for multiple transistor manufacturers, with no calibration needed. The remote channel can also measure the die temperature of other ICs, such as microprocessors, that contain an on-chip, diode-connected transistor.

The Fan control IC also contains a 2-channel fan speed controller. It connects directly to the fans and performs closed-loop control of the fan speed independently. The only external component required is a 10 μ F capacitor per channel. It determines the current fan speed based on the fan rotation pulses and an externally supplied 32.768KHz clock.

It uses pulse width modulation (PWM) method and an on-chip MOSFET to control the fan speed to $\pm 2\%$ of the programmed speed. The desired fan speed is also programmed via SMBus™. The actual fan speed and fan status can be read via the SMBus™. Short-circuit protection is implemented to prevent damages to the fan and this IC itself. The accepted frequency of fan rotation pulses is 100~1000Hz, which corresponds to 3,000 to 30,000 rpm for a typical fan that produces two pulses per revolution. The IC also turns on the fans by hardware watchdog system. The fan controller would fully turn on both fans when one of the following conditions happens.

1. when either of the remote temperature is higher than its own TMAX.
2. when either of these two remote diodes is open.
3. when both remote diodes are short

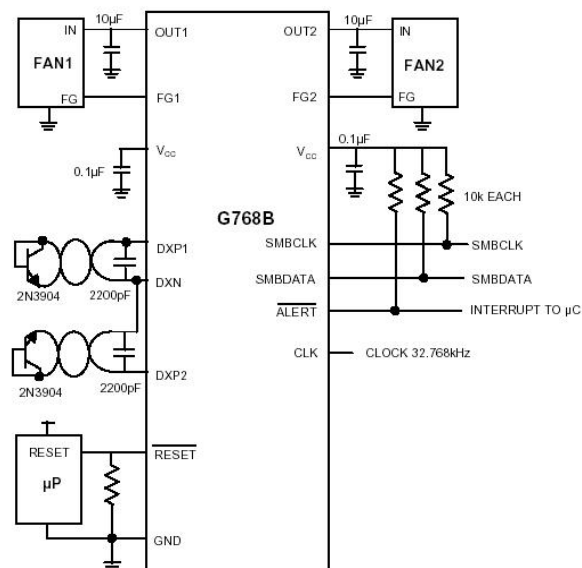


Figure 7. Fan Control IC Operating Circuit

DMD Frame Overview

The DLPTM DDP1000 based component set provides a highly integrated, high performance DLP solution, which enables manufacturers to create small size, high brightness projectors. The component set, when implemented with the proposed reference design, provides all the electronics required to drive and control the DLPTM display sub system on about 10 to 12 in² of PWB.

The DDP1000 ASIC integrates an embedded ARM7 microprocessor and FPGA/ASIC functionality on to a single chip. A single Flash memory is utilized for ARM7 code and DMD sequence information. With a Double-Data-Rate (DDR) DMD output up to 60MHz, the DDP1000 supports faster DMD load times giving more flexibility to system designers for color and brightness tradeoffs and improved video performance. To support the higher bandwidth DMD interface, the DDP1000 utilizes a high bandwidth single 128Mbit or 256Mbit Direct RDRAM memory. In addition to a more integrated DLP solution, the DDP1000 also offers improved image quality through advances in DLP image processing. As with prior DLP electronics solutions, image data is 100% digital from the input port to the image projected on the display screen. Digital input is accepted from the 24-bit RGB/YUV image input port up to the native DMD resolution. The DDP1000 processes the digital input and converts the data into a bitplane output format to drive the DMD image bus. The DDP1000 provides improved boundary dispersion and a new blue-noise spatial temporal multiplexing (STM) algorithm for improved low level noise performance. In addition to degamma, color space conversion, white peaking, contrast and brightness image adjustments, the DDP1000 offers enhanced color correction allowing independent adjustment of primary and secondary colors and white point. The DDP1000 also provides a new dark histogram function to enhance the contrast and brightness of certain images. The DDP1000 provides system level control for the lamp and color wheel and support for fan control. The DDP1000 based product offers 2x color wheel operation for RGWB and RGWBRGB color wheels and 3x color wheel operation for RGWB wheels. The 2x RGWBRGB and 3x RGWB configurations offer reduction in color

sequential artifacts. The DDP1000 supports DC, Osram VHP and Philips UHP type lamp interfaces. The DDP1000 offers improved support for Philips UHP lamp drivers. The DDP1000 provides 2 programmable PWM outputs that can be used for fan control or other applications. The DDP1000 is configured over an industry standard I2C bus up to 400KHz. The Flash memory can be reprogrammed over the I2C or the optional USB interface.

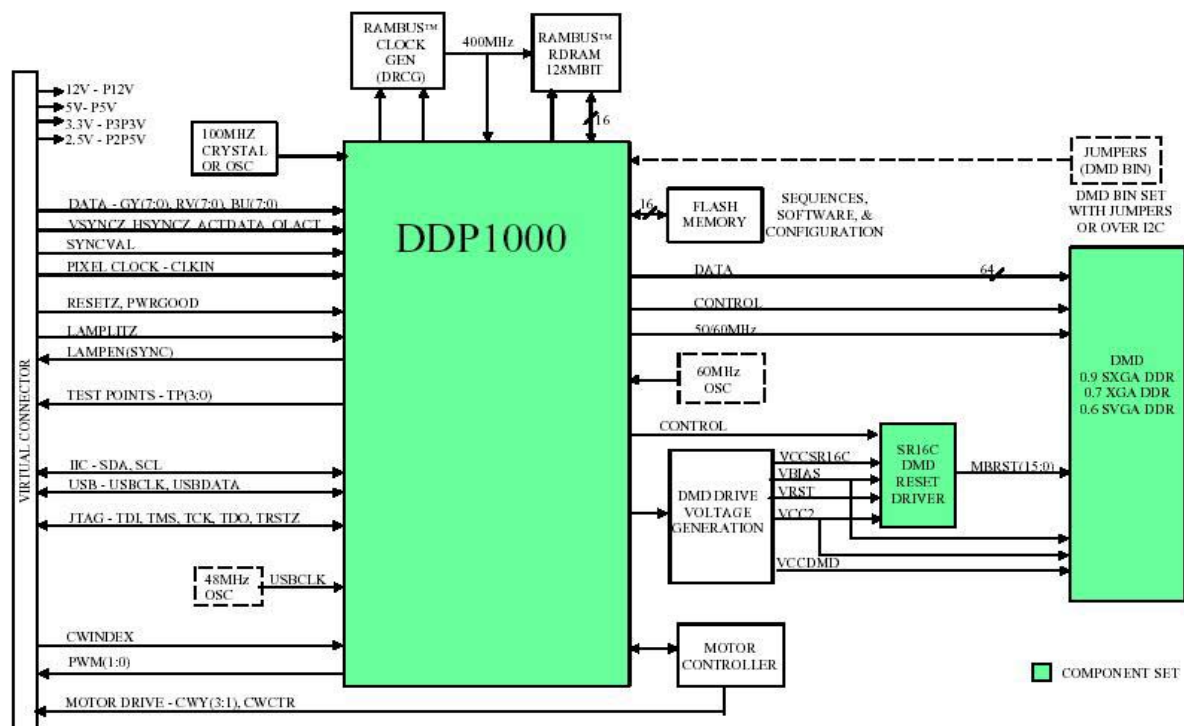


Figure 8 Single DDP1000 Architecture DMD Formatting Electronics Block Diagram

Digital Component Interface

Input Clock - CLKIN

The DDP1000 electronics requires a stable, free running input pixel clock (CLKIN) for displaying data on the screen. GY(7:0), BU(7:0), RV(7:0), HSYNCZ, OLACT and ACTDATA signals are sampled using the rising edge of CLKIN and they must be synchronous with CLKIN. If CLKIN drops out or is out of specification, the DDP1000 electronics will no longer display valid data until CLKIN is again stable. If CLKIN is not valid, signal SYNCVAL can be used to apply the Video Curtain to the screen until CLKIN is again valid.

Digital Component Data - GY(7:0), BU(7:0), and RV(7:0)

GY(7:0), BU(7:0), and RV(7:0) are digital component video busses. Inputs can be Green, Red and Blue (RGB) or Luminance and color difference signals (YUV).

Vertical and Horizontal Sync - VSYNCZ, HSYNCZ

VSYNCZ indicates the basic display frame reference signal. The falling edge of VSYNCZ is detected and indicates the beginning of an image frame. VSYNCZ does not need to be synchronous with CLKIN. HSYNCZ indicates the basic display line reference signal. The falling edge of HSYNCZ is detected and indicates the beginning of an image line. HSYNCZ must be synchronous with the rising edge of CLKIN.

Active Data Indicator - ACTDATA

ACTDATA indicates when image data is valid on GY(7:0), BU(7:0), and RV(7:0). ACTDATA must be high for the same number of pixels for each line that contains active pixels. ACTDATA must be high for contiguous pixels within a line. ACTDATA does not have to be high for contiguous lines within a frame; some lines can be skipped between active lines. ACTDATA must be synchronous with the rising edge of CLKIN.

Overlay Active Indicator - OLACT

The OLACT signal indicates whether the active data on GY(7:0), BU(7:0), and RV(7:0) is video or overlay. OLACT should only be asserted high when ACTDATA is high.

Sync Valid Indicator - SYNCVAL

SYNCVAL indicates when the data and control signals of the digital component interface are valid and the signals correspond to the configuration loaded over the control interface. If SYNCVAL is low, the signals on the digital component interface are ignored and a Video Curtain is displayed. The color of the video curtain is programmable via the control interface. When SYNCVAL is high the DDP1000 electronics will display an image corresponding to the digital component interface signals and the configuration loaded over the control interface. If the digital component interface signals or configuration is invalid when SYNCVAL is high erroneous data will be displayed.

I2C Control Interface Definition

The DDP1000 electronics control interface supports a single I2C interface up to 400KHz. This interface is used to control and configure the DDP1000 electronics. The DDP1000 electronics' Flash memory can also be reprogrammed over the I2C interface. For Interface definition, see the I2C bus specification. The software command interface is defined in the DDP1000 Software Interface Control Document.

USB Interface Definition

The DDP1000 electronics supports an optional USB, slave only, version 1.1 interface for reprogramming the Flash memory via bulk data transfers. To utilize the USB interface a 48MHz clock must be provided on the USBCLK pin on the DDP1000 ASIC. See the Universal Serial Bus specification for further information.

Master Clock

The DDP1000 ASIC requires a 100MHz master clock. For single DDP1000 ASIC configurations, this clock can be generated either by a crystal or an oscillator. See the DDP1000 customer datasheet for detailed requirements. An oscillator and clock buffer are recommended for a 2 DDP1000 ASIC SXGA system. See reference design schematics for circuit details.

DMD Interface Considerations

The DDP1000 electronics supports SVGA, XGA and SXGA resolution DDR type DMDs. All three DMDs can be driven with 1 DDP1000 ASIC. In addition, SXGA can be driven with 2 DDP1000 ASICs for higher performance applications. The DMD interface can be configured to derive its clock from the DDP1000 master clock (MOSC). In this case the DMD interface clock will be 50MHz. The DDP1000 electronics also supports supplying an external 60MHz oscillator to run the DMD interface. See DDP1000 customer datasheet for oscillator requirements. Using an external 60MHz oscillator provides the minimum DMD load time, which results in the best artifact performance. For XGA systems utilizing a 60MHz DMD clock, line spreading is required on the input interface to achieve the minimum load time at some pixel clock rates.

Direct Rambus™ Memory

The DDP1000 utilizes a high speed Direct Rambus™ (RDRAM) memory. To support the RDRAM a Direct Rambus™ clock generator (DRCG) is utilized. This RDRAM interface is a very high speed and care must be taken in PWB layout to ensure success. While the user can leverage off of the TI reference design documentation, TI recommends the user follow the Rambus™ design guides called out in the DDP1000 reference design layout guidelines.

RDRAM Memory

The DDP1000 ASIC utilizes a single RDRAM memory.

Direct Rambus™ Clock Generator

The DDP1000 ASIC Rambus™ interface requires an external Direct Rambus™ clock generator (DRCG).

Flash Memory

The DDP1000 electronics utilizes a Flash memory for storage of ARM software, configuration and sequences.

Color Wheel Control

Motor Drive

The DDP1000 electronics supports driving three phase, 8 pole (preferred), 12 or 16 pole, Y configuration, brushless DC color wheel motors. The DDP1000 electronics uses a combination of back EMF from the motor and the CWINDEX to frequency and phase lock the color wheel revolution to a fixed factor of the VSYNCZ rate. The DDP1000 electronics provides a choice of 2X or 3X modes of operation.

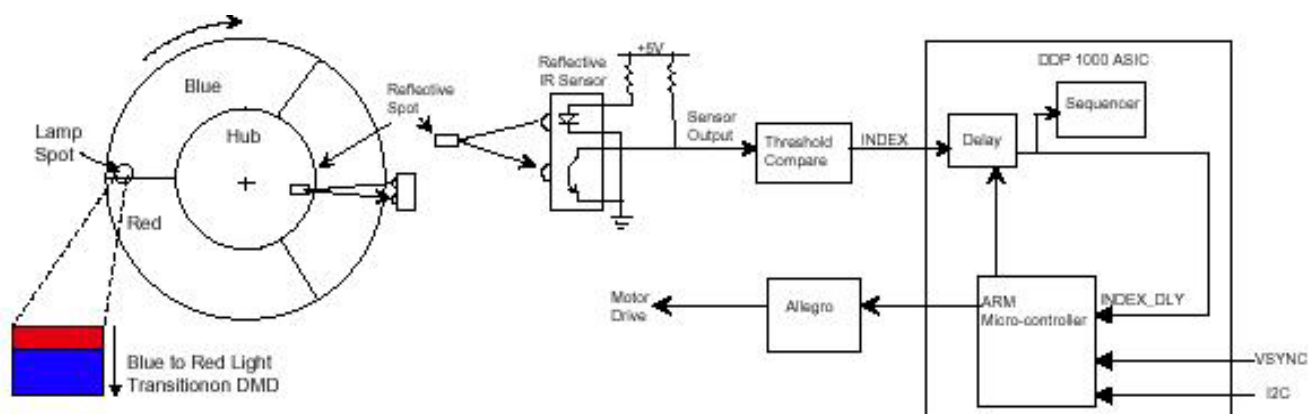
The DDP1000 electronics utilizes an Allegro 8902A or 8906 motor driver. Motor parameters must be carefully selected to insure compatibility with the motor driver. The following factors must be taken into account:

- Motor driver power dissipation
- Back EMF margin
- Motor driver watchdog timing

Maximum power dissipation typically occurs at the slowest speed and the highest supply voltage. Process variation of the motor parameters should also be considered. In order for the motor control loop to work there must be adequate back EMF margin. Process variation of the motor parameters should also be considered. The Allegro utilizes a watchdog capacitor to set a blanking time after the outputs are commutated. This blanking time is needed to ignore false zero crossing that can occur due to inductive recovery and voltage settling transients after the outputs are commutated. The watchdog capacitor is selected to blank the worst case transients at motor start up without being too large to blank real zero crossings at the maximum color wheel rate. The duration of the transients is related to the inductance and resistance of the motor. While TI strives to support a wide range of motors and color wheel sizes, some combinations of motors and color wheels might not be compatible with the DDP1000 reference design electronics.

Color Wheel Index - CWINDEX

The DDP1000 electronics uses the CWINDEX to phase and frequency lock the color wheel to a multiple of the vertical sync (VSYNCZ). The DDP1000 electronics phases the display of the data on the DMD based on the CWINDEX signal. The CWINDEX indicates the beginning of the red light on the DMD device. The DDP1000 electronics can be configured over the command interface to delay the CWINDEX. This is useful for electronic alignment of the color wheel. The delay at a color wheel rate of 120Hz is specified over the I2C command interface. The DDP1000 electronics scales the delay based on the ratio of 120Hz divided by the actual wheel rate. The delayed color wheel index is available on a test point.



Lamp Power Supply Control Signals

The DDP1000 electronics can control DC, Philips UHP and Osram VHP type lamp ballasts. Other lamp ballasts with compatible interface can be supported. The DDP1000 electronics provides a lamp enable (LAMPEN) signal for lamp control and a lamp lit (LAMPLITZ) signal for status from the lamp ballast.

Lamp Enable - LAMPEN

The DDP1000 electronics provides a lamp enable (LAMPEN) signal to control the projector lamp and ballast. The LAMPEN is used for on/off control as well as synchronization of AC lamps. The state of LAMPEN after a reset is low. This is normally the lamp off state of the lamp ballast. Once PWRGOOD and RESETZ are high and the color wheel is spinning at speed, the DPP1000 electronics drives the LAMPEN high. For AC and DC ballasts it is assumed that the lamp ballast will ignite the lamp when LAMPEN is driven from low to high. For AC lamps the ballast must drive the lamp with internal synchronization when LAMPEN is held high. The DDP1000 provides an I2C lamp disable command. The LAMPEN will be driven low as a result of this command.

Lamp Disable Mode Note: If the End Item product is left in lamp disable mode and the product is unattended, the possibility of the building power recycling exists. This may cause the End Item Product to reset the DDP1000 electronics with signal RESETZ. When RESETZ goes back high (and PWRGOOD is high) the DDP1000 electronics will default LAMPEN to high.

The LAMPEN signal can also be used to synchronize an AC lamp. Once the lamp is lit and stable a lamp synchronization I2C command can be sent to the DDP1000 electronics. The DDP1000 electronics will respond by outputting lamp synchronization timing on the LAMPEN. The DDP1000 electronics supports three types of lamp synchronization signaling: level, rising edge and rising edge with feedback. In the level synchronization mode, the level of the LAMPEN controls the direction of the current to the lamp (Figure 9). This mode typically supports Osram VHP lamp ballasts. The second type of synchronization is referred to as rising edge. In this mode, the rising edge of the LAMPEN causes the current to the lamp to alternate (Figure 10). This mode typically supports Philips Ballasts. The third option is rising edge with feedback. This mode typically supports Philips' Ballasts that have capability to provide status on the LAMPLITZ signal.

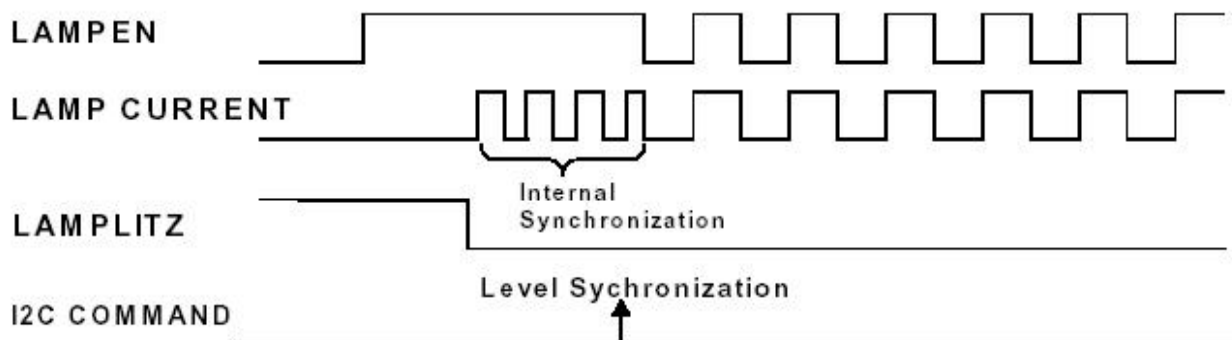


Figure 9 Level Lamp Synchronization Mode Timing

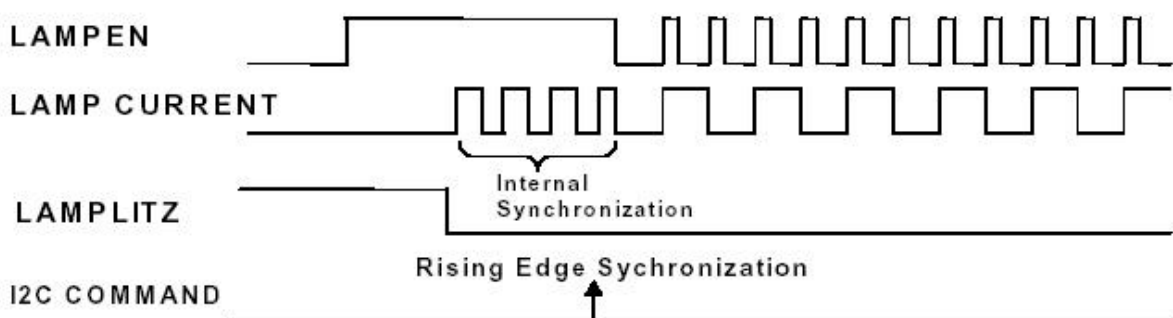


Figure 10 Rising Edge Lamp Synchronization Timing

Lamp Lit - LAMPLITZ

The LAMPLITZ signal shall be asserted to the DDP1000 electronics after successful ignition of the projector lamp. The transition of LAMPLITZ from high to low is used to reset the DDP1000 electronics, so the LAMPLITZ signal must transition from high to low after the lamp ignition EMI pulse is over to guarantee operation is not affected by the ignition EMI. No DDP1000 electronics configuration should be attempted until LAMPLITZ is low and stable. When the lamp is disabled the LAMPLITZ shall be driven high. See Figure 11 for detailed timing on the LAMPLITZ during power up.

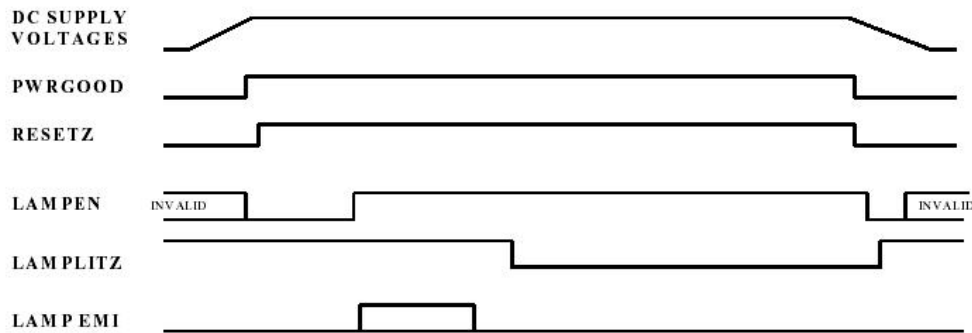


Figure 11 Lamp Power Supply Interface Timing

Power and Initialization Requirements

Power Good - PWRGOOD

DC supply voltages may be applied in any order at power-up and removed in any order at power down. The PWRGOOD signal shall be driven high to the DDP1000 electronics when all the input DC supply voltages are within the recommended operating limits. The DDP1000 electronics requires that PWRGOOD be driven low in advance of the DC power supplies dropping out of the recommended operating limits. This time is used to park the DMD.

RESETZ

When RESETZ is low the DDP1000 electronics goes into a reset default state and the DMD is parked. When RESETZ transitions from low to high the DDP1000 will begin initialization.

Control Interface at Power-up

At power-up, the DDP1000 electronics Control Interface is not functional for some period until the internal initialization is complete. Figure 12 indicates the requirements for the Control Interface commands at power-up.

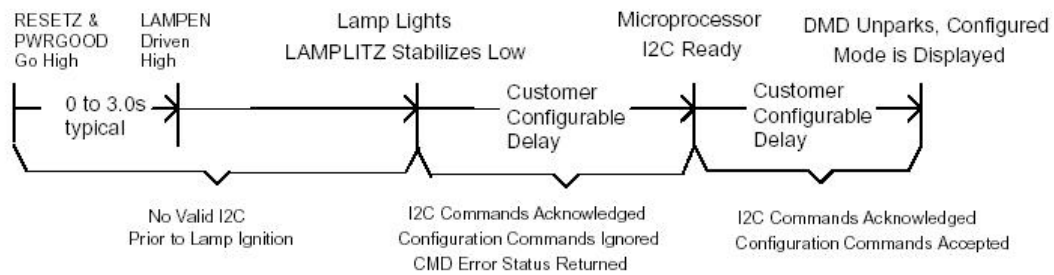


Figure 12 Control Interface at Power-up

DMD Bias Bin

Each DMD is tested at TI and assigned a bias voltage bin. The bin must be properly set in the driving electronics to ensure DMD device reliability. The DDP1000 provides two methods for setting the DMD bias bin. The first method utilizes hardware jumpers. See reference design schematics for implementation details. The second method is to configure the bin over the I2C command interface. The bias bin must be configured each time the DDP1000 electronics is powered on or reset. See the DDP1000 electronics software ICD for programming information.

Appendix C DMD Image Quality

This document is an excerpt from TI's document 2501907

1. SCOPE

This document specifies the image quality requirements applicable to the DLPTM XGA ComponentSet. The Component Set provides the DLPTM XGA Projector (herein referred to as the Projector), with digital imaging functionality based on Digital Micromirror Device (DMD) technology.. Other requirements for the Kit are specified in TI Drawing 4144756.

2. Definitions

2.1 Blemish

A blemish is an obstruction, reflection, or refraction of light that is visible, but out of focus in the projected image under specified conditions of inspection (see Table 1). It is caused by a particle, scratch, or other artifact located in the image illumination path.

2.2 Dark pixel

A single pixel or mirror that is stuck in the OFF position and is visibly darker than the surrounding pixels.

2.3 Bright pixel

A single pixel or mirror that is stuck in the ON position and is visibly brighter than the surrounding pixels.

2.4 Unstable pixel

A single pixel or mirror that does not operate in sequence with parameters loaded into memory. The unstable pixel appears to be flickering asynchronously with the image.

2.5 Adjacent pixel

Two or more stuck pixels sharing a common border or common point, also referred to as a cluster.

2.6 Streaks

Artifact resulting from localized variation in mirror tilt angle relative to surrounding mirrors. They are similar in appearance to window scratches but appear at the mirror level. Streaks appear as faint diagonal or arcing patterns in the image.

2.7 Sea of Mirrors (SOM)

SOM is a rectangular array of off-state mirrors surrounding the active area.

2.8 Eyecatcher

A small localized light "spot" which has high spatial frequency and high differential brightness. These are due to various DMD window or window aperture "defects" including: digs, voids, particles and scratches.

2.9 Border Artifacts

All variations of these artifacts are acceptable under this image quality specification. Border artifacts are a general category of image artifacts that may show up on screen in the area outside of the active array. Border artifacts include: Exposed Bond Wires, Exposed Metal 2, and Reflective Edge.

2.9.1 Bond Wires

Bond Wires attach the die to the superstructure. If visible, they will appear as short light parallel lines outside of the Sea of Mirrors (SOM).

2.9.2 Exposed Metal 2

Exposed Metal 2 is due to a shift in positioning of either the die or the window aperture, which may allow light to be reflected off of the layer of metal 2 that is below the super structure (mirrors). This defect is located at the outer edge of the SOM.

2.9.3 Reflective Edge

Reflective Edge is light that may reflect from the edge of the DMD's window aperture onto the projection screen. It will appear as a thin diffuse line outside of the SOM.

2.10 Two Zone Blue 60 Screen

The Two Zone Blue 60 screen is used to test for major dark blemishes. Refer to Figure 1 for configuration. All areas of the screen are colored a Microsoft Paintbrush blue 60 (green and red set at 0, blue set at 60).

NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent blue level on the test screen image.

2.11 Two Zone Gray 10 Screen

The Two Zone Gray 10 screen is used to test for major light blemishes. Refer to Figure 1 for configuration. All areas of the screen are colored a Microsoft Paintbrush gray 10 (green, red, and blue set at 10).

NOTE: If linear degamma is not used then the Microsoft Paintbrush values must be adjusted to match the degamma table being used in order to generate an equivalent gray level on the test screen image.

The Kit shall provide digital imaging functionality, in accordance with the Projector system design allocations, such that it provides the Projector with the functional capability to project images that meet the image quality requirements specified in Table I and it shall not possess artifacts or other characteristics that cause projected images to fail to meet those same requirements.

1. ACCEPTANCE REQUIREMENTS

3.11 Conditions of Acceptance

All DMD image quality defects must be determined under the following projected image test conditions:

- a. Projector degamma shall be linear.
- b. Projector error diffusion shall be “off.”
- c. Projector brightness and contrast settings shall be set to nominal.
- d. The diagonal size of the projected image shall be a minimum of 60 inches.
- e. The projection screen shall be 1X gain.
- f. The projected image shall be inspected from an 8 feet minimum viewing distance.
- g. The image shall be in focus during all Table 1 tests.
- h. Operator Vision

Verification that projected images meet the specified acceptance criteria shall be performed by operators that:

- a. Have 20/20 or better natural or corrected vision as determined by Snellen chart or equivalent eye tests
- b. Are capable of distinguishing colors as determined by Ishihara or equivalent color blindness eye test.

3.2 Test Sequence

Tests shall be run in the sequence listed in Table 1.

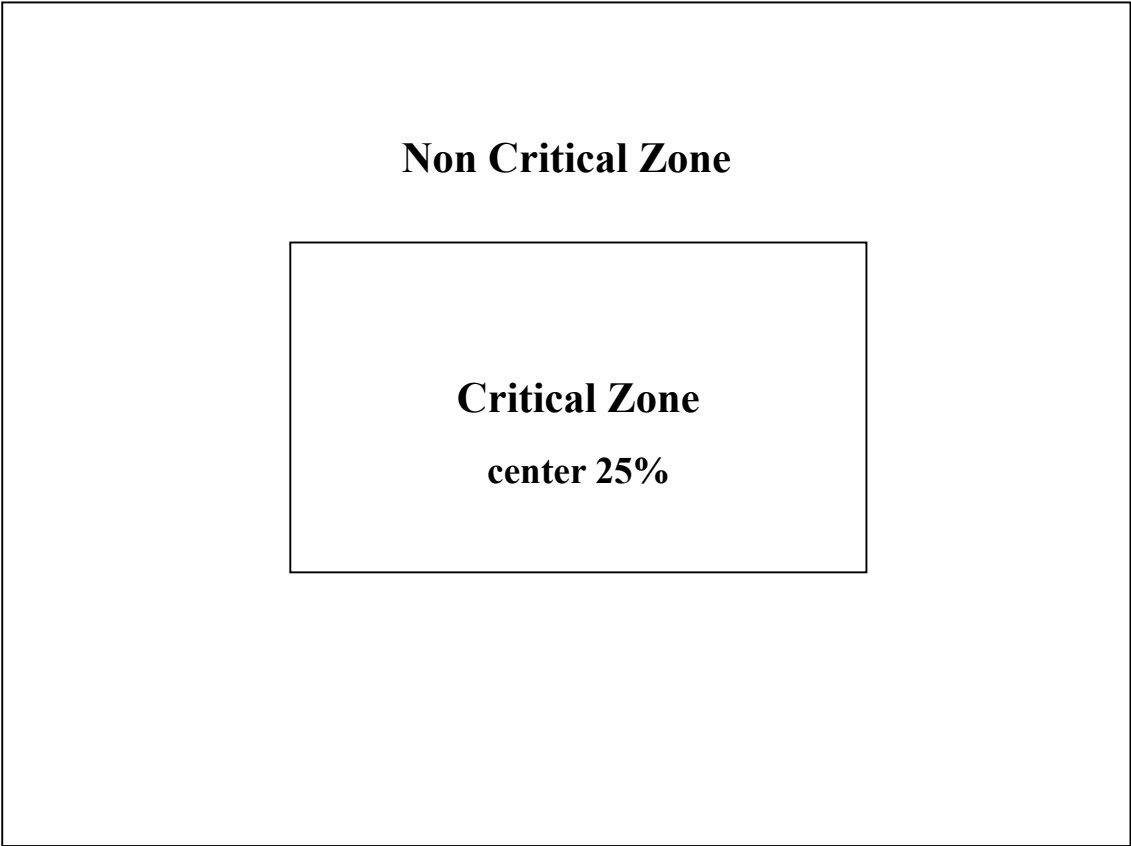
TABLE 1. Image Quality Specification

SEQ #	TEST	SCREEN	ACCEPTANCE CRITERIA
1	Major Dark Blemish	Two Zone Blue 60	1. No blemish will be darker than Microsoft Blue 60 in the Critical Zone 2. 2 blemishes in the Non-Critical Zone 3. No blemish will be $> \frac{1}{2}$ " long/diameter
2	Major Light Blemish	Two Zone Gray 10	1. No blemish will be lighter than Microsoft Gray 10 in the Critical Zone 2. 2 blemishes in the Non Critical Zone 3. No blemish will be $> \frac{1}{2}$ " long/diameter
3	Eyecatcher	Gray 10	1. No eyecatcher will be lighter than Microsoft Gray 10
	Streaks	Blue 60 Gray 10 White	1. No streaks
	Projected Images	Any screen	1. No adjacent pixels 2. No bright pixels (Active Area) 3. 1 bright pixel (SOM) 4. 4 dark pixels 5. 6 minor blemishes 6. No DMD window aperture shadowing on the Active Area 7. No unstable pixels in Active Area

Notes: Tests shall be performed in the sequence indicated in Table I.

1. Projected blemish numbers include the count for the shadow of the artifact in addition to the artifact itself, so that the count usually represents a single artifact on the window.
2. No blemish shall be more than 5 inches long or have a total area of more than 5 square inches on a 60-inch diagonal projected image. ($\approx \frac{1}{2}$ inch for Major Blemish tests)
3. During all Table 1 tests, projected images shall be inspected in accordance with the conditions of inspection specified in Section 3.
4. The rejection basis for all cosmetic DMD defects (scratches, nicks, particles) will be the projected image tests referenced in Table 1.
5. Any other image quality issue not specifically defined in this document shall be acceptable.
6. Black screens shall not be used as a basis for rejecting DMDs for image quality.

Figure 1. Major Blemish Two Zone Screen



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